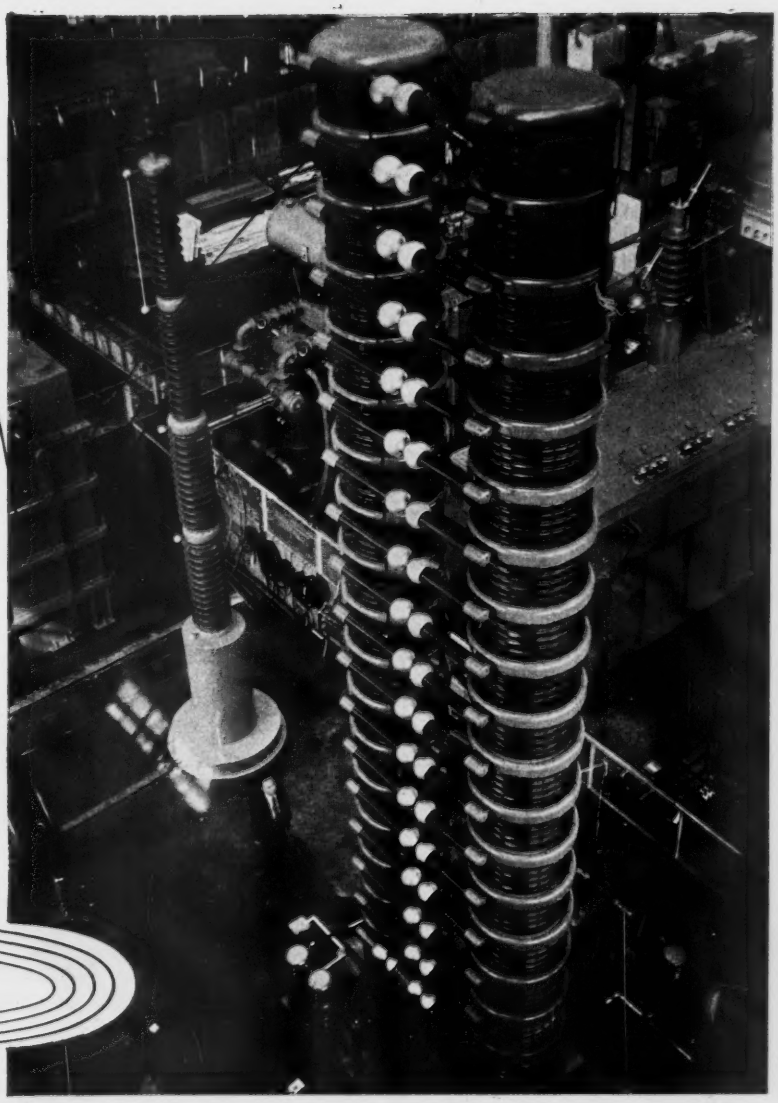
ELECTRICAL REVIEW

5 JULY 1957

4,000,000 Volts

THE LARGEST IMPULSE GENERATOR IN EUROPE

The illustration shows a 4,000,000 volt 18 stage, 2 column Ferranti Impulse Generator energy rating 285 kW seconds, D.C. charging 220 kV per stage. Designed and built by Ferranti engineers, it is the largest impulse generator in Europe and is now installed in the Ferranti Transformer Factory at Hollinwood for high voltage impulse testing of large power transformers.



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High Voltage Impulse Generators
are used throughout the world.

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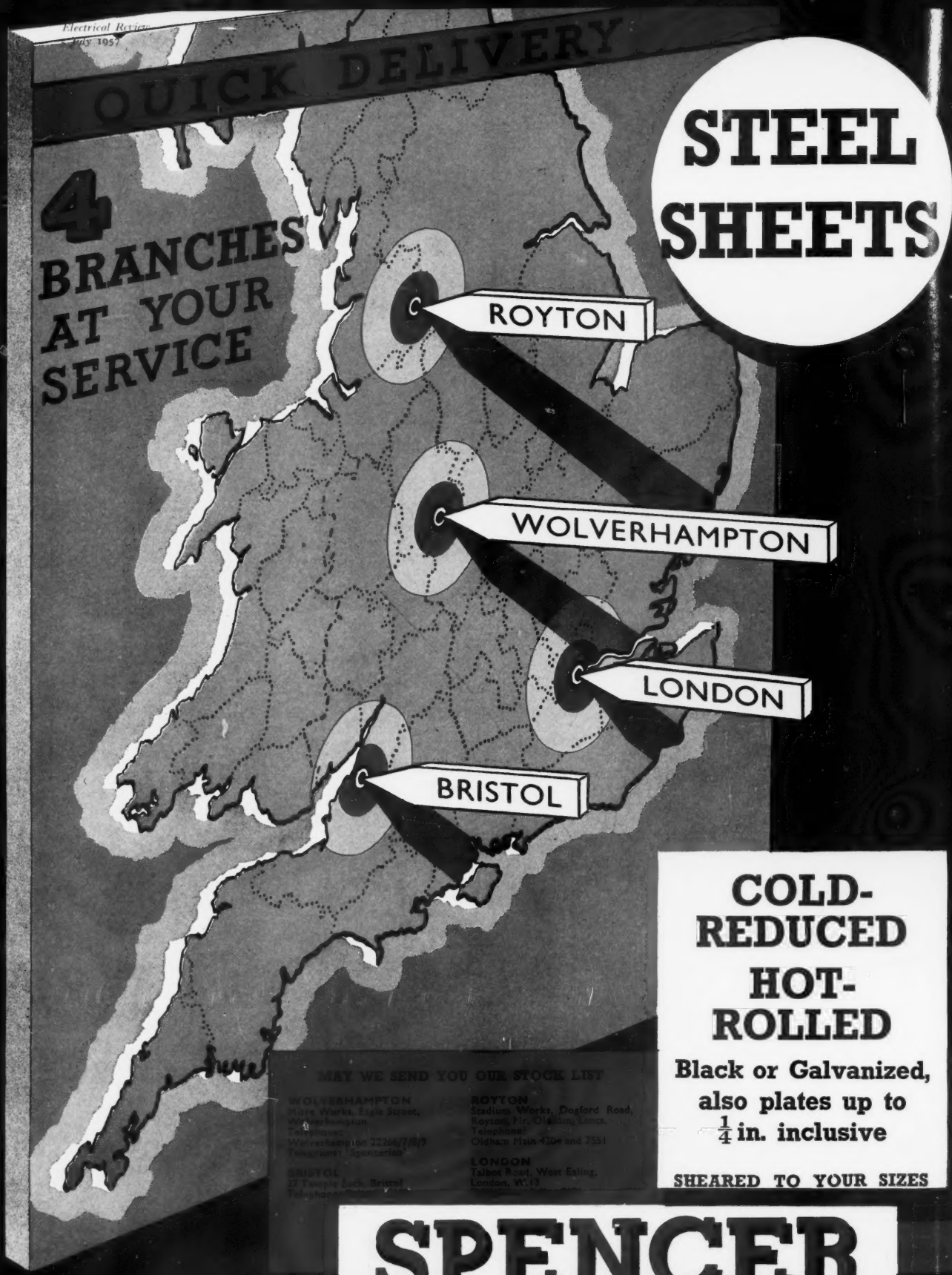
London Office: KERN HOUSE. 36 KINGSWAY. W.C.2.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Down Alton way, when a fellow cycles home from work, the woods and fields and streams he sees are those his father knew. The people who lift a hand and exchange a word as he passes are people he knows and knew as a boy. He's a man with a name and a home and a place in his own community: and he feels—who wouldn't?—that life's the better for that. And the batteries men like him are making in Alton? Well, a storage battery is among the most tightly specified, uniform products made. And yet, year after year, come letters telling us our batteries serving overseas have a certain distinguishing overall merit of their own. It could be that what a life that's better than merely worth living puts into a man, comes out in the form of work which is just that vastly important bit better than 'up to specification'.

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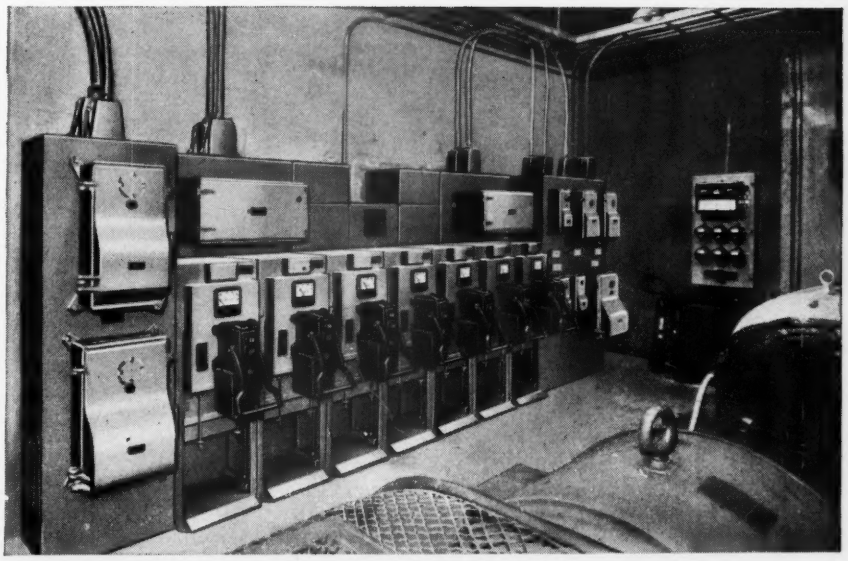
Telephone : CROYDON 4125-6-7-8



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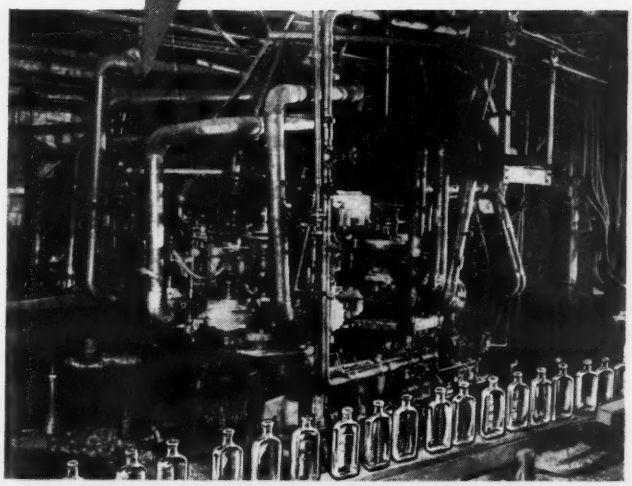
SWITCHGEAR & MOTOR CONTROL GEAR

The choice of Messrs. Lax & Shaw Ltd. Glass Bottle Manufacturers, of Leeds



Continuous production is essential in this vast bottle factory and complete reliability of the electricity supply vital. The obvious choice for Switchgear and Motor Control Gear was, therefore, Erskine Heap, renowned the world over for utmost reliability.

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It's the Switchgear engineers like to "live" with.

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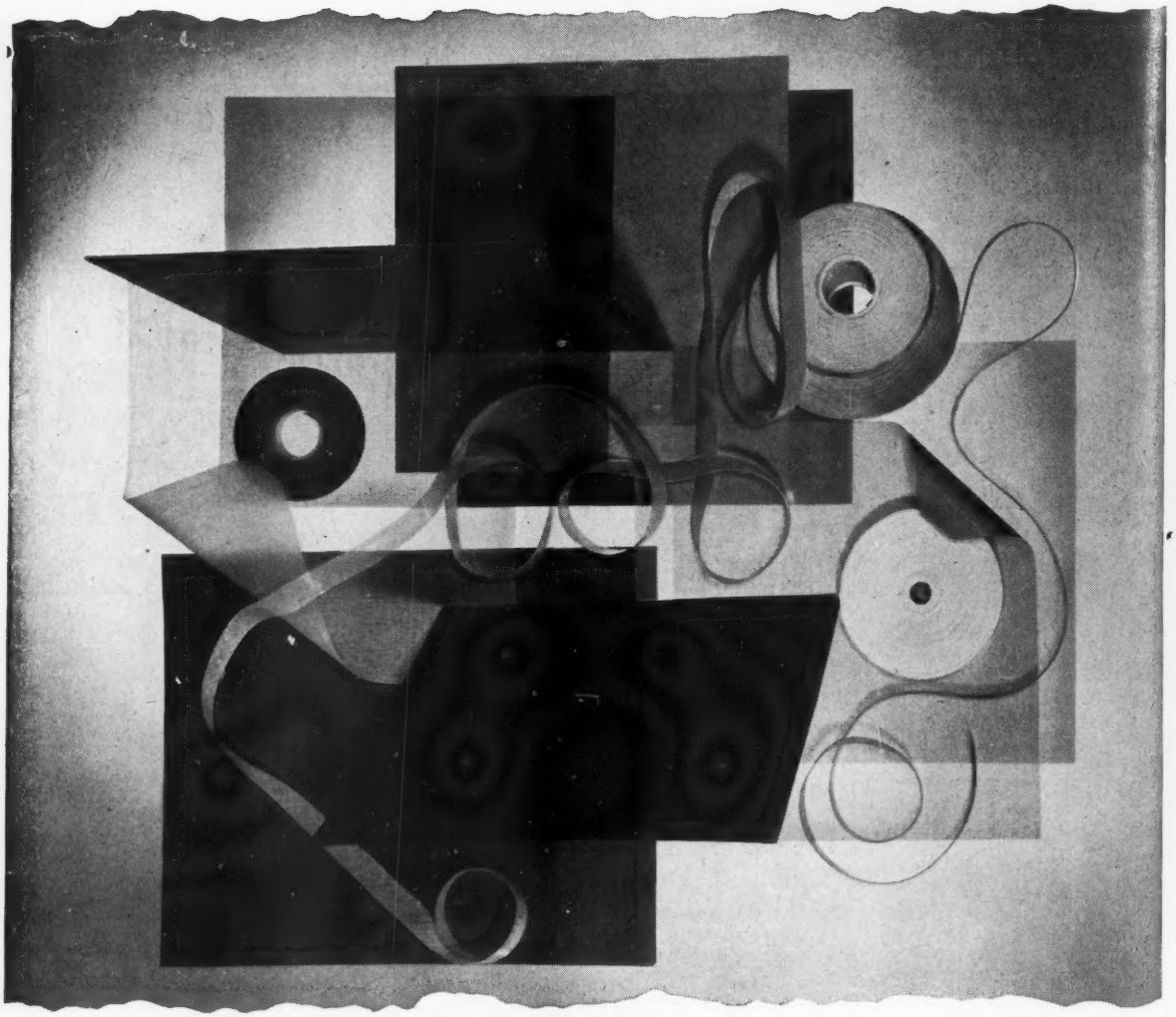

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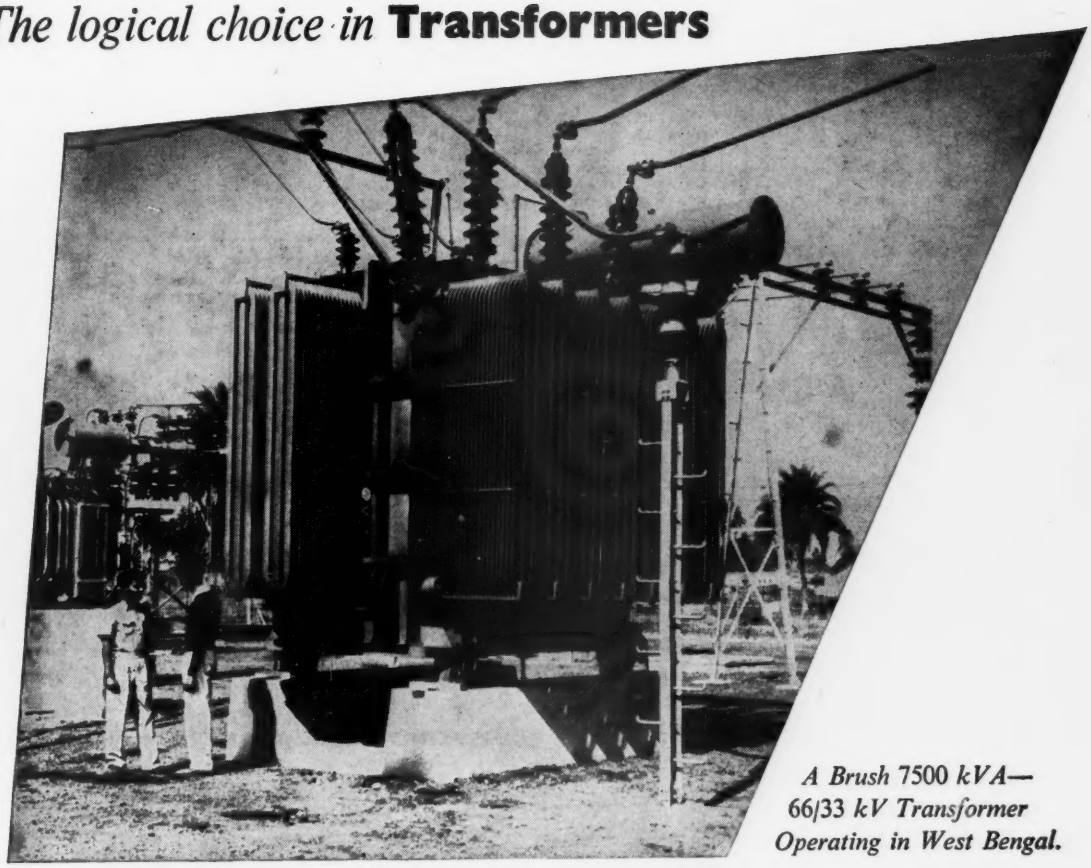

A Brush 7500 kVA—66/33 kV Transformer Operating in West Bengal.

At home and abroad, Brush Transformers stand as a striking testimony to the thoroughness with which they are built to give long service under extreme climatic conditions. For power and distribution purposes, Brush Transformers are built in sizes up to 45 MVA and 220 kV.

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Full details of the Units available on application to Department ***S.H.5.***

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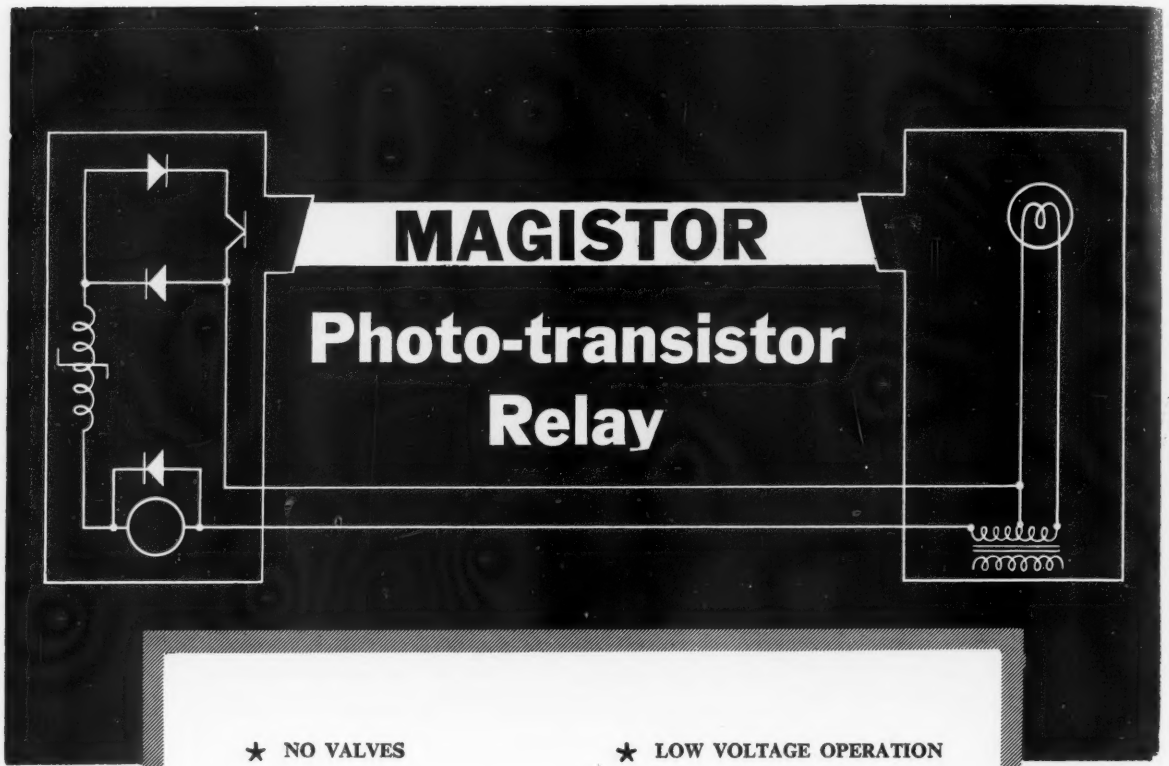

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The Metrovick "Magistor" photo-transistor relay is the latest development in photo-electric control. Designed to meet the demand for a small and reliable photo-electric relay the equipment consists of a lamp box and receiver, each only 7⅝" high x 4⅛" wide x 3⅜" deep. Using a photo-transistor and flux resetting magnetic amplifier, it dispenses with thermionic valves and other consumable components in the receiver.

Metrovick engineers are always available to advise on any photo-electric application. For further details please write for leaflet 4098/2.

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PRACTICAL ELECTRONIC CONTROLS

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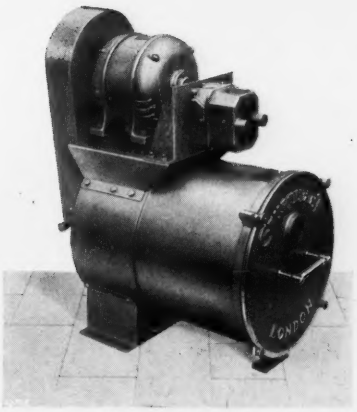

This Sturtevant No. 5MT Turbo-exhauster, is used for the reclamation of Flux deposits from continuous welders.

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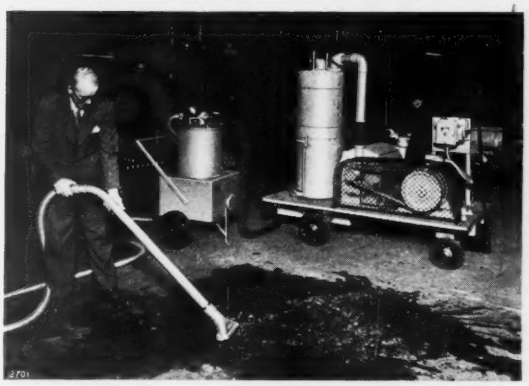

A Sturtevant No. 6X industrial Vacuum Cleaner with special interceptor for collecting broken glass and liquids.

General particulars of Sturtevant Vacuum Cleaners are given in our publication No. U5007B which is obtainable upon request.

A Sturtevant No. 4X machine with special cleaning nozzle used in boiler flue cleaning.

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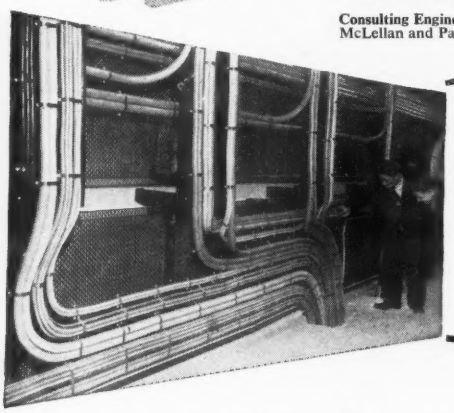

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HUDDERSFIELD

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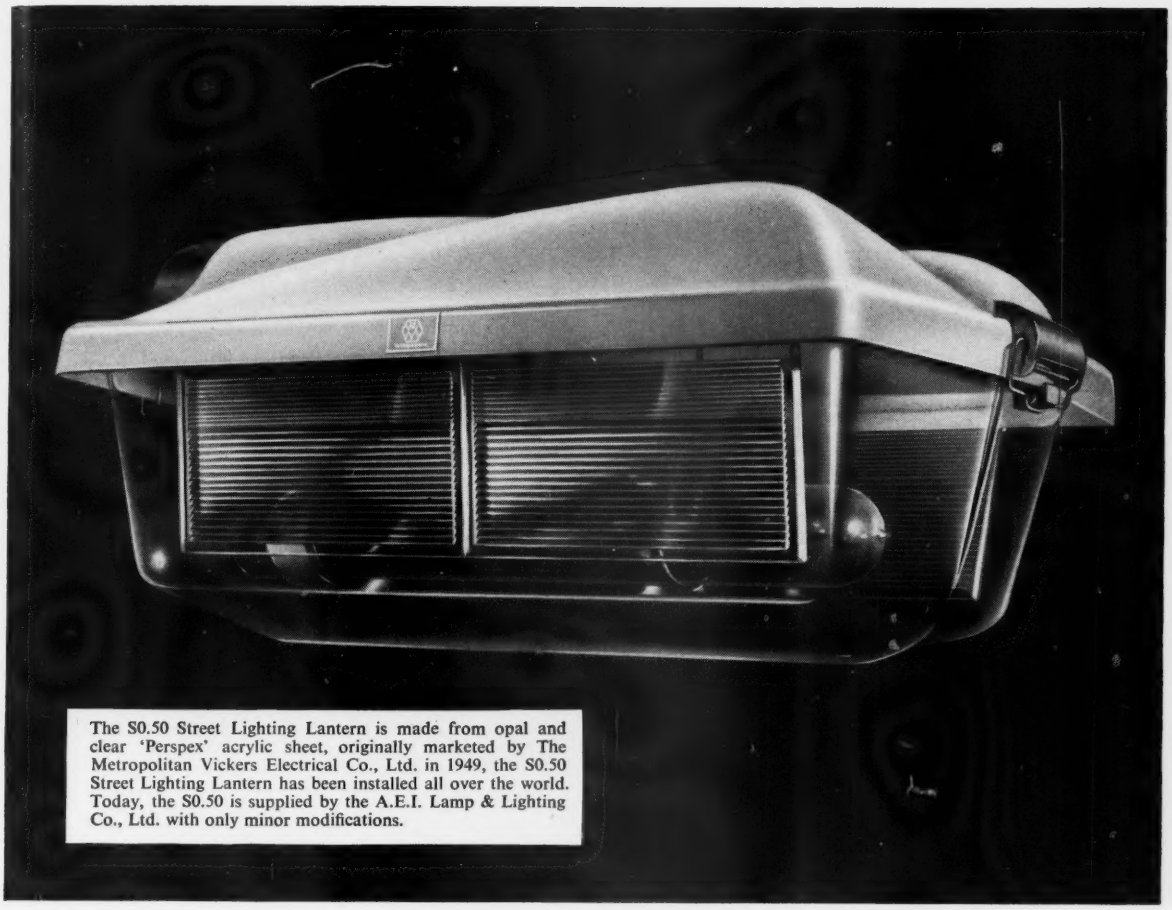

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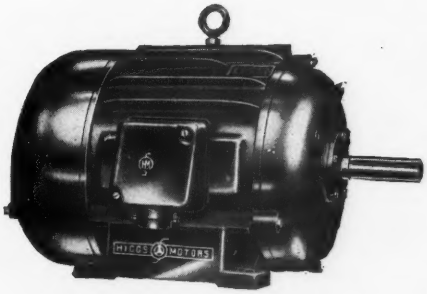

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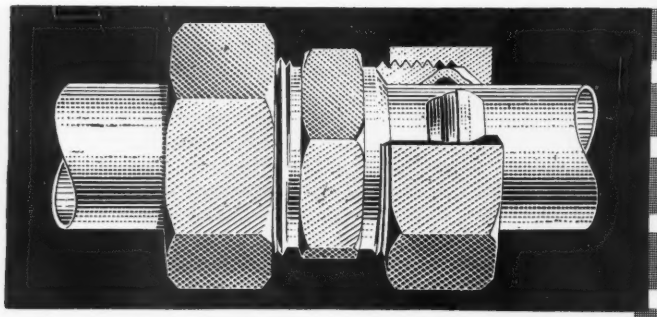

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CABLE TRUNKING

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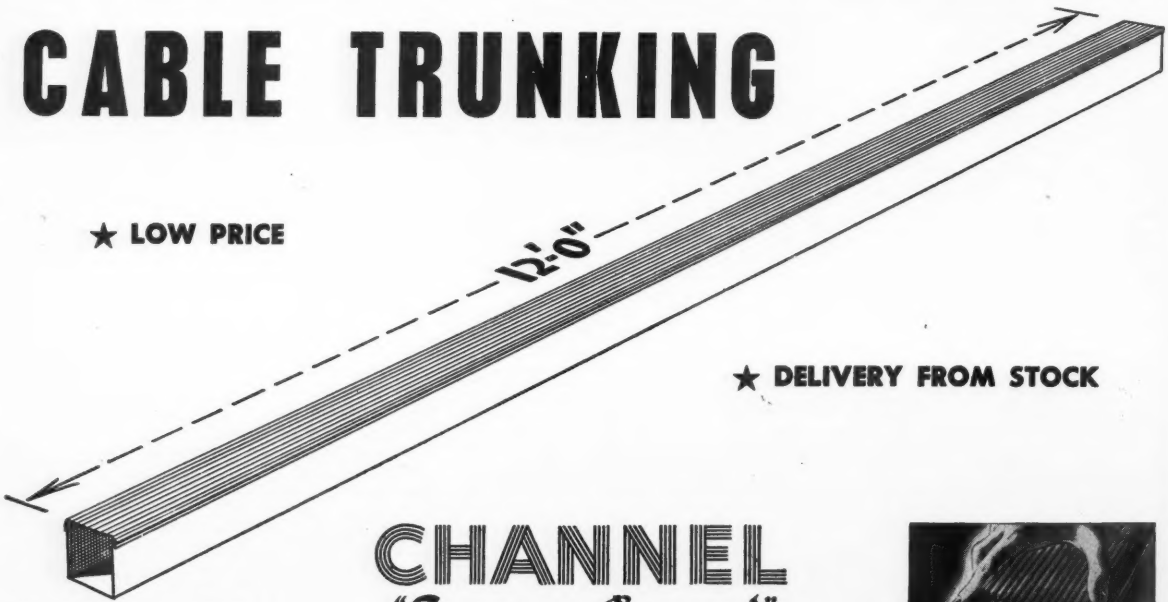

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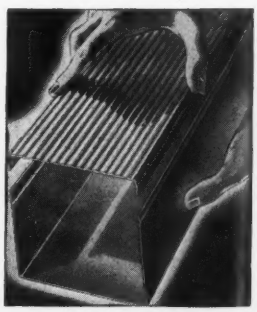

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* Its 4-heat automatic timer switch gives the exact degree of dryness required and, once set, means there is no need to watch it !
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* The Auto-Dry is superbly engineered and beautifully finished. It has the Parnall reputation behind it.
* The Auto-Dry will appeal to millions of women who own washing machines. Make sure of your share of the market.

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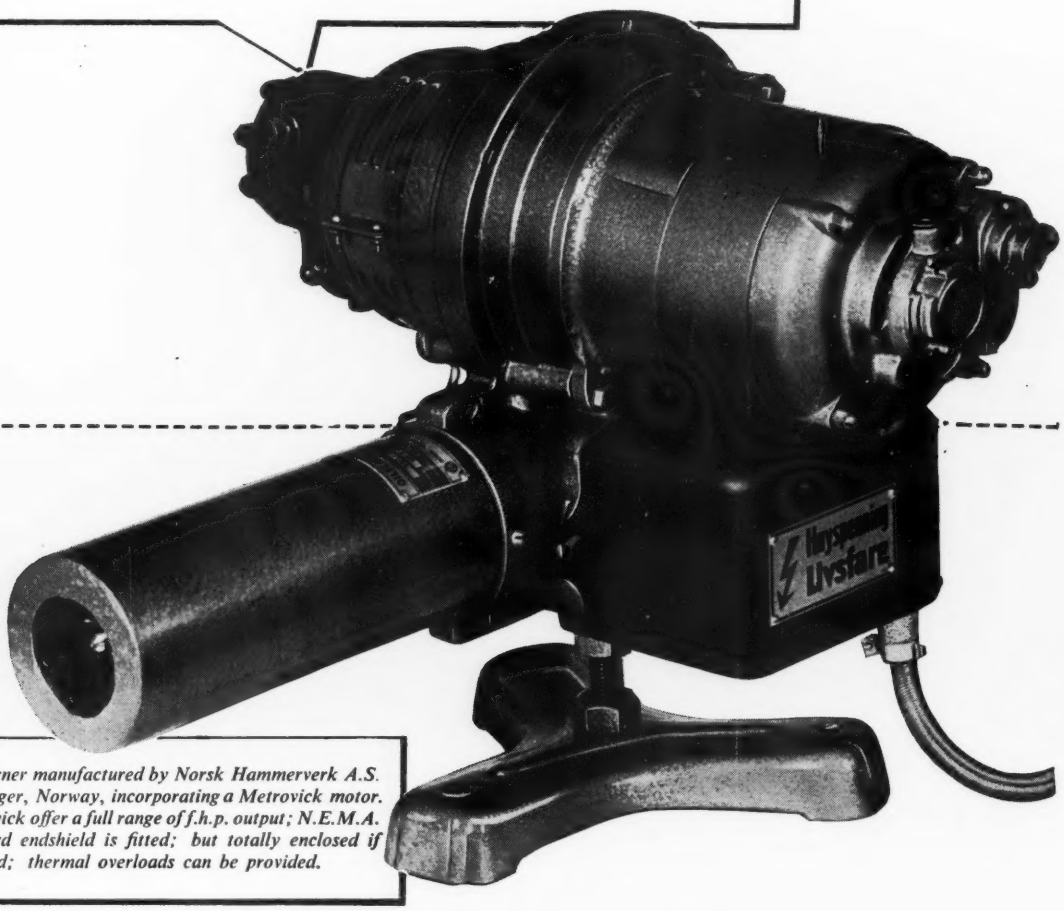
Metrovick Motors for Oil Burners



Oil burner manufactured by Norsk Hammerverk A.S. Stavanger, Norway, incorporating a Metrovick motor. Metrovick offer a full range of f.h.p. output; N.E.M.A. standard endshield is fitted; but totally enclosed if required; thermal overloads can be provided.

Use of oil for the heating of commercial, industrial and domestic premises is increasing and will increase further. The heart of a burner is a completely reliable fractional h.p. motor and wise manufacturers will standardise on Metrovick. Norway, where oil heating is relatively more advanced, chooses M-V motors for this service. Ask for details of the Metrovick range.

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Metrovick Fractionals Give Trouble-Free Service

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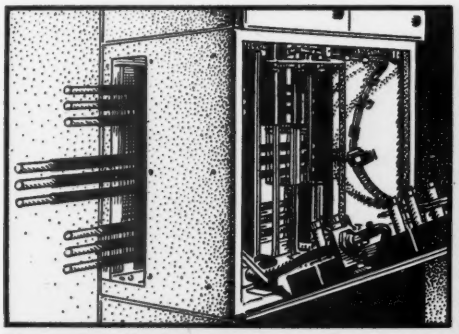
just how important are plastics in industry?

. . . that's a question answered by the British Plastics Exhibition at Olympia where, for the first time, British achievements in plastics are shown side by side with the efforts of other countries.

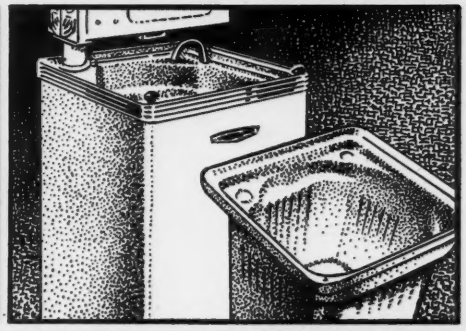
The National Plastics exhibit is of special interest. It shows many moulded and extruded components, in many different plastics materials, which are supplied in large quantities to British Industry and incorporated in finished products ranging from motor cars to radio sets.

These components are important, not because they are in any sense substitutes for conventional materials, but because their special qualities do the job better, or do a job which only they can do.



Extruded P.V.C bus bar covers for the English Electric Co. Ltd.

moulded glass-reinforced polyester resin washer tub for Vatric Ltd.



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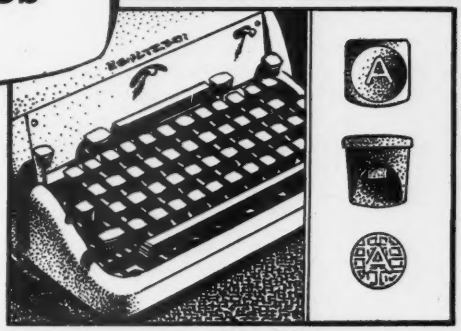

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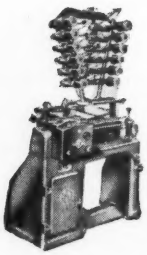

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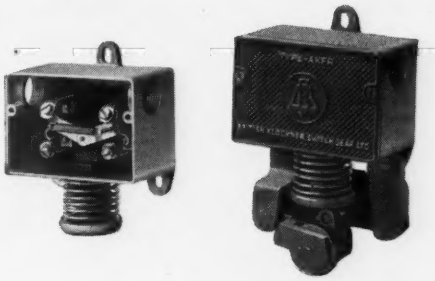

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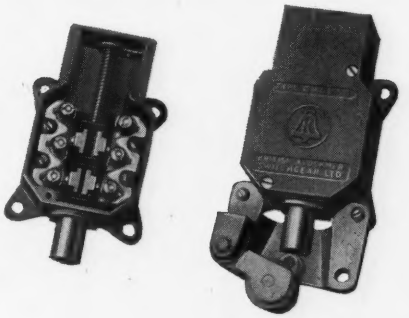
Suitable for 600 Volts A.C. or D.C. · Maximum load 2 amps · Two independent circuits with instantaneous change-over · No OFF-position, no dwell.
Type AFKR—List 4-1.



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Suitable for 500 Volts A.C. 2 amps · Maximum of three independent circuits · Can be used in conjunction with Contactors for any Automatic Cycle of operations, as Starting, Stopping, Change-over or Interlock Switch.
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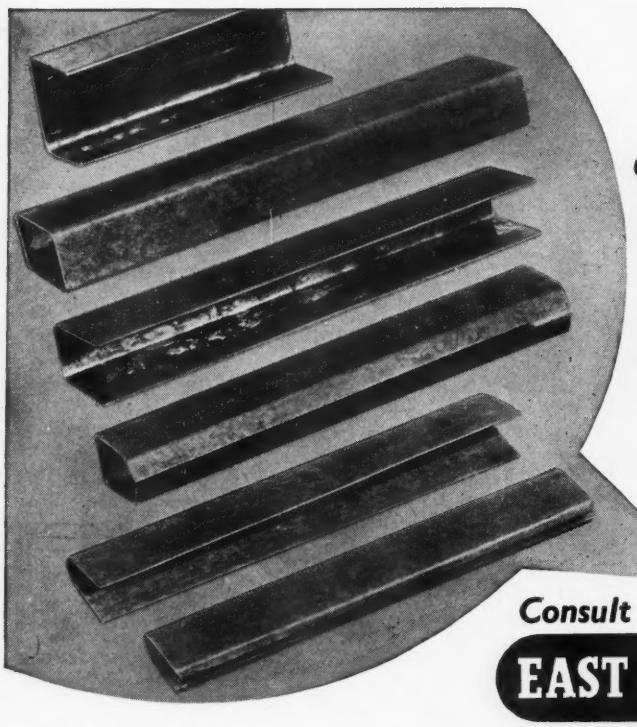

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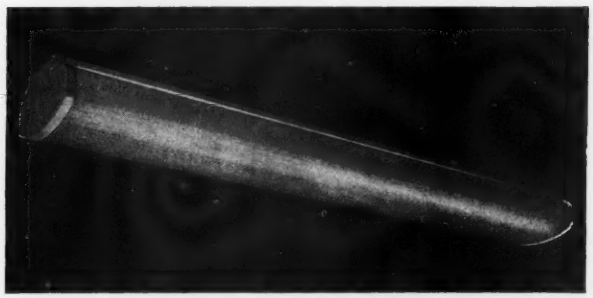

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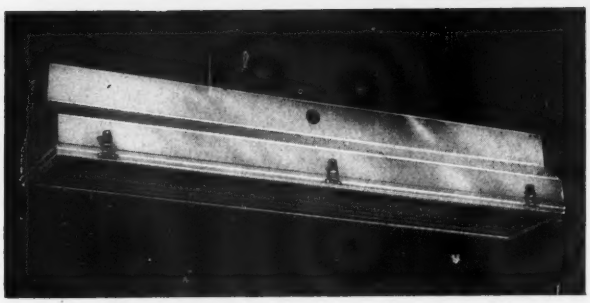

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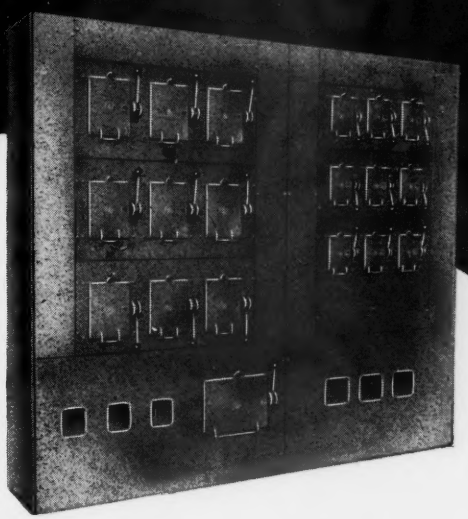

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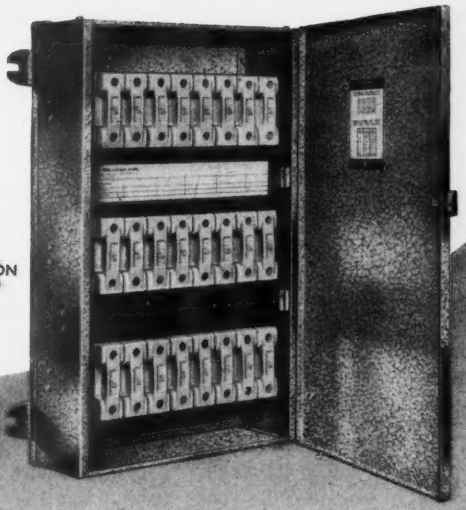

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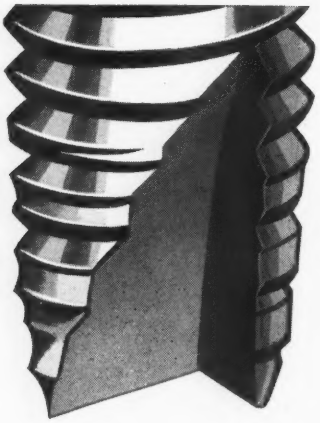

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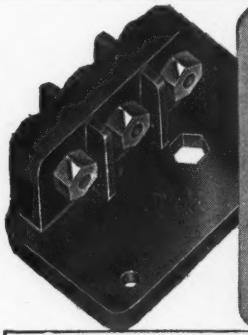

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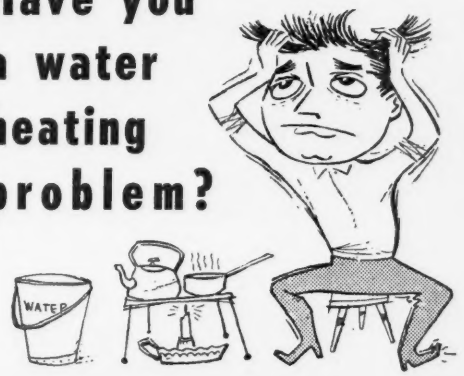

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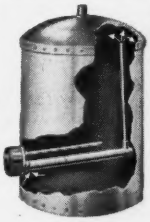

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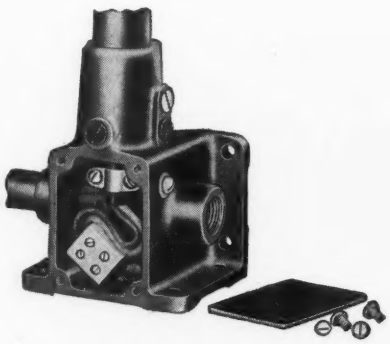

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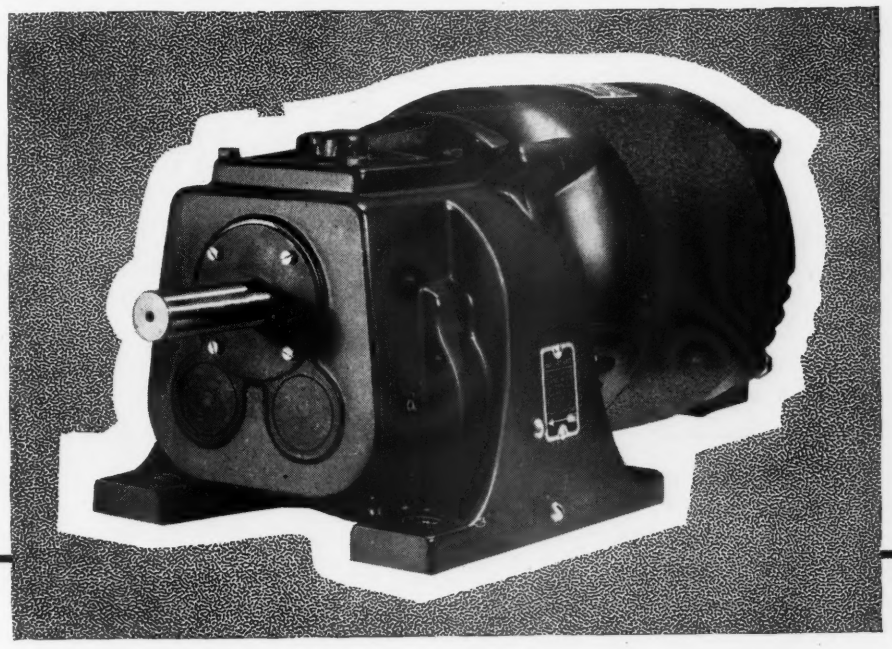

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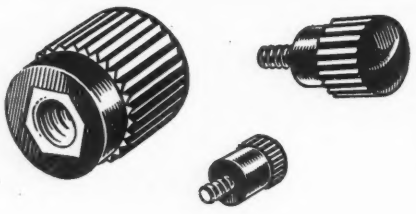

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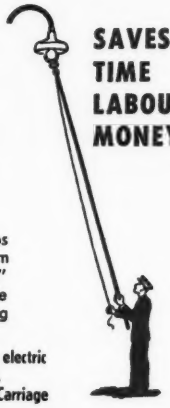

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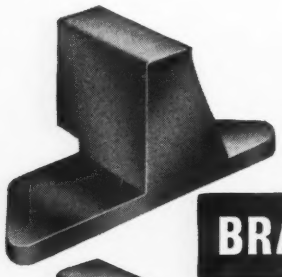

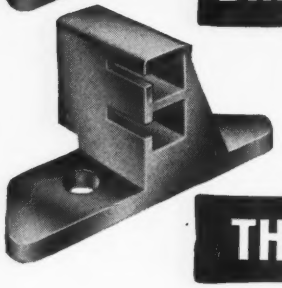

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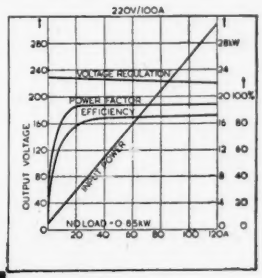

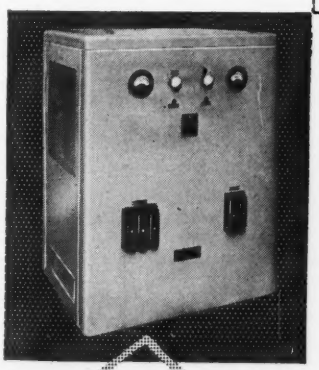

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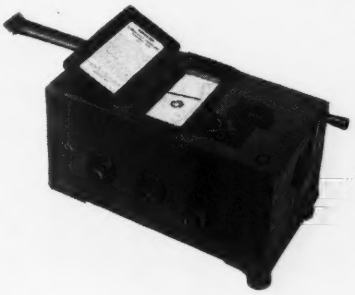

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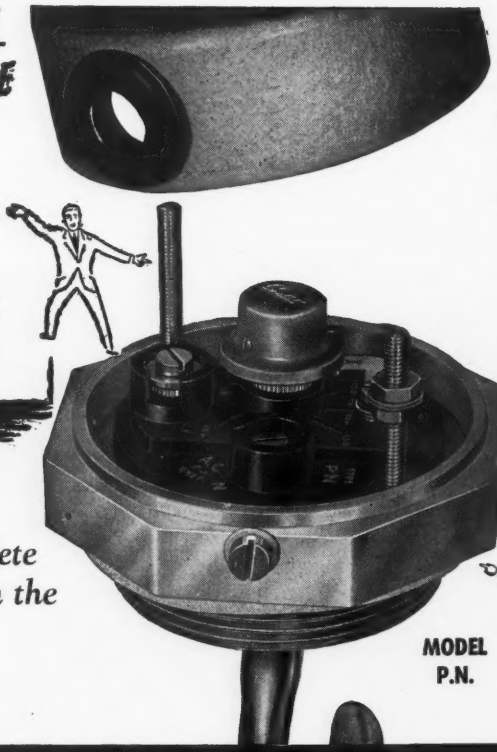

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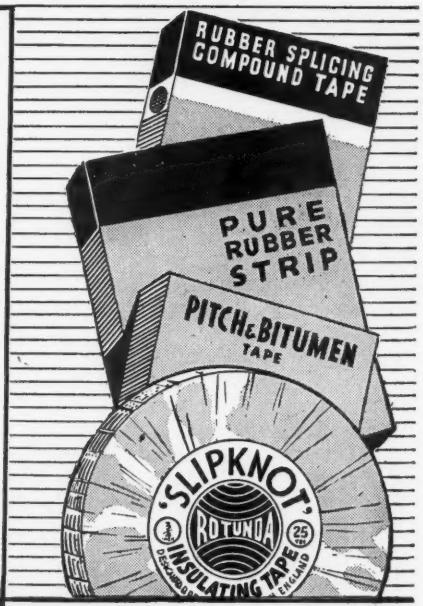

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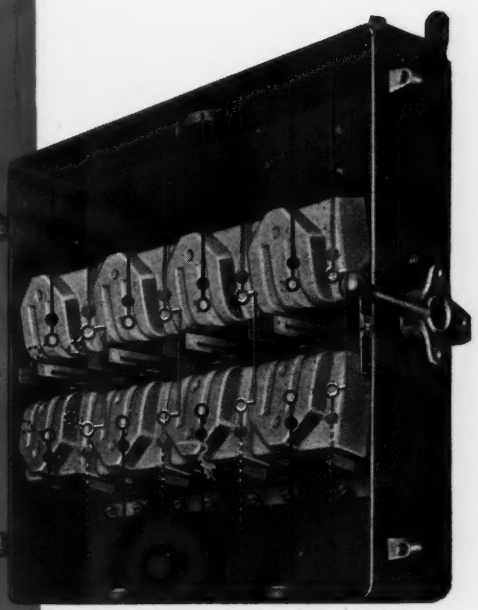

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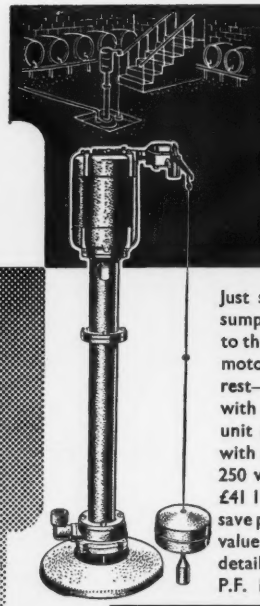

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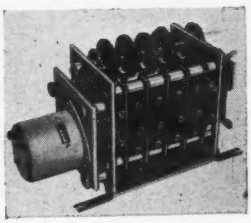

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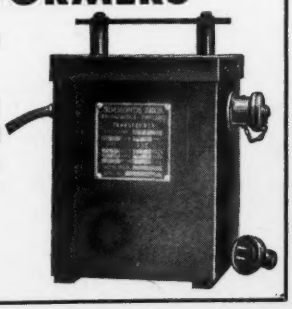

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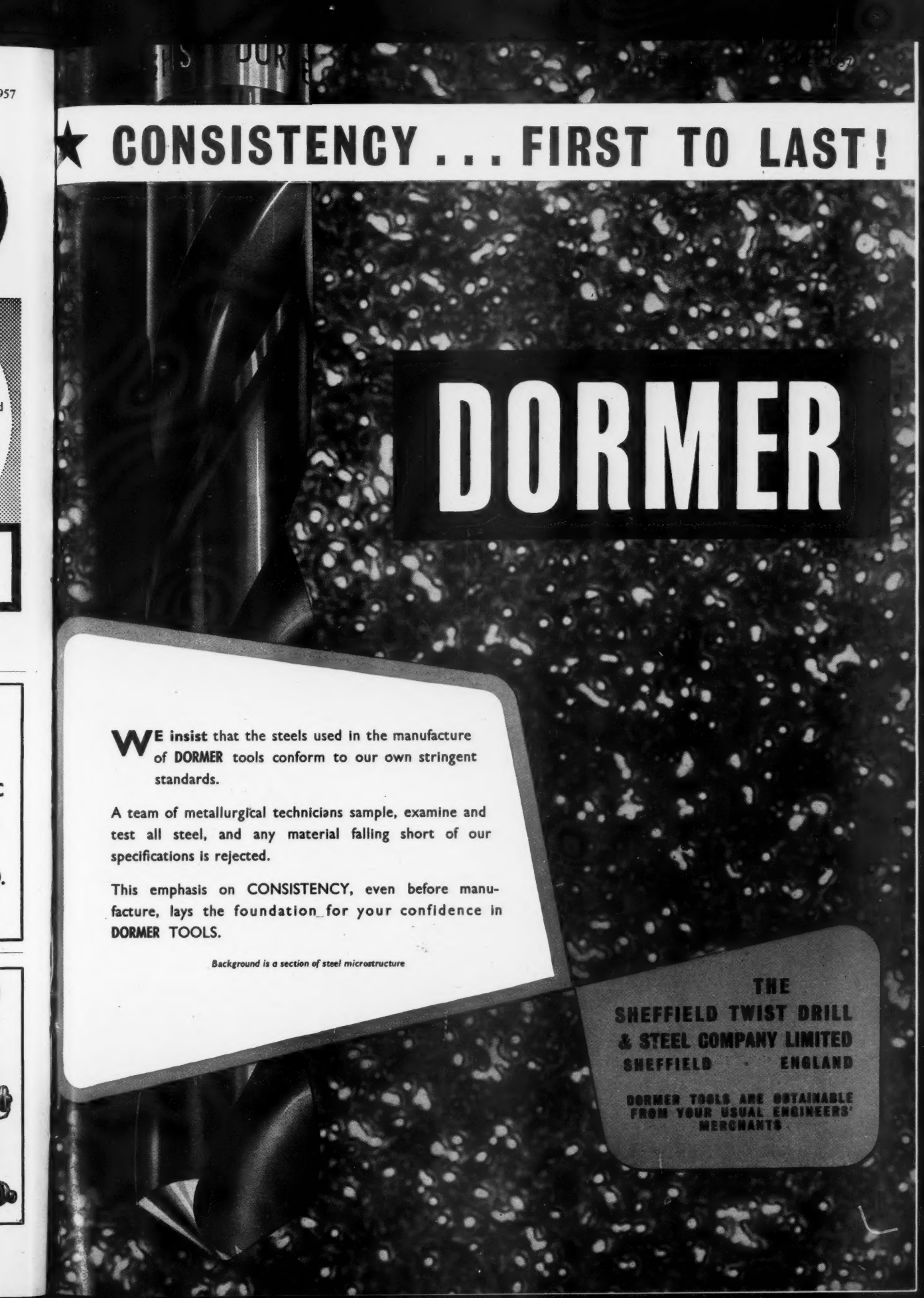
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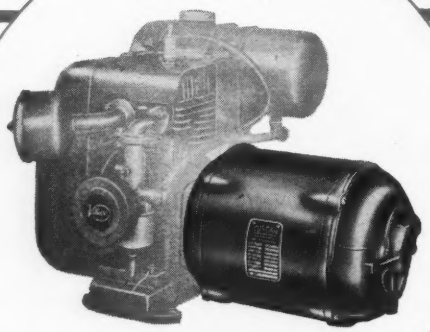

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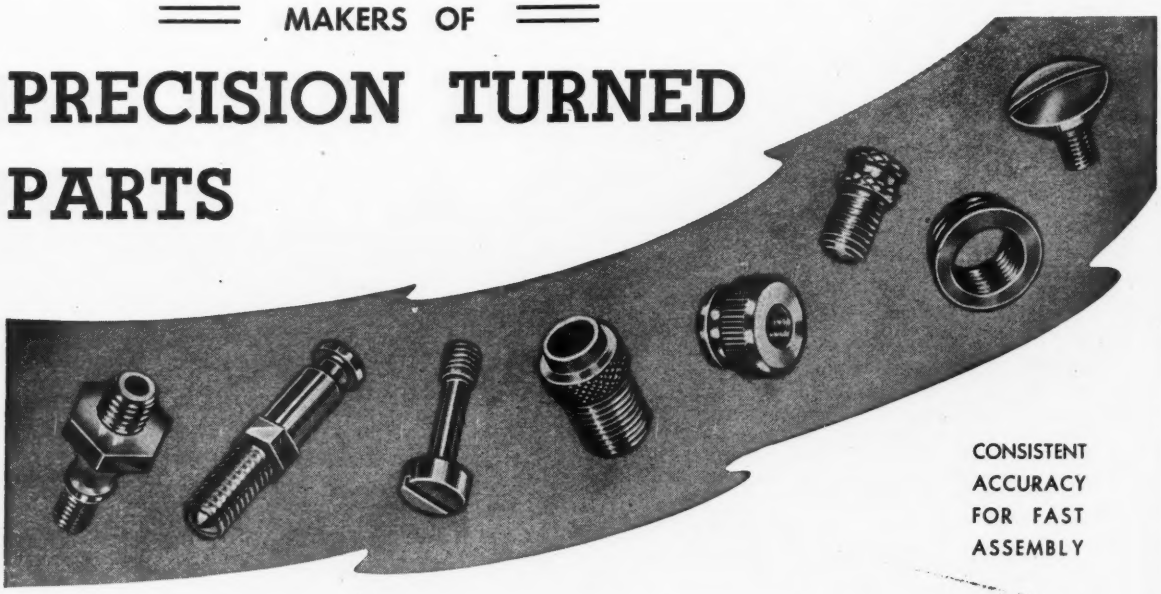

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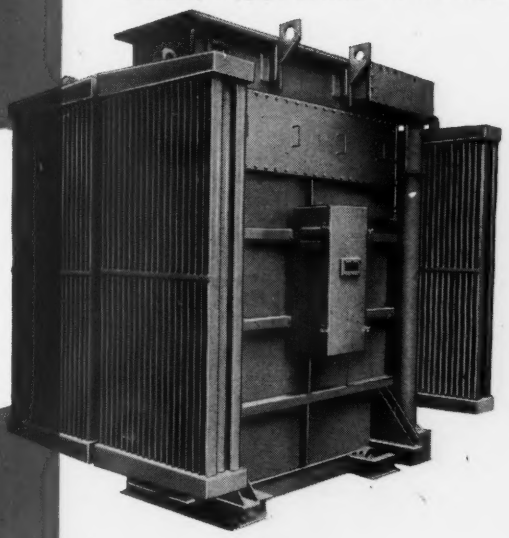

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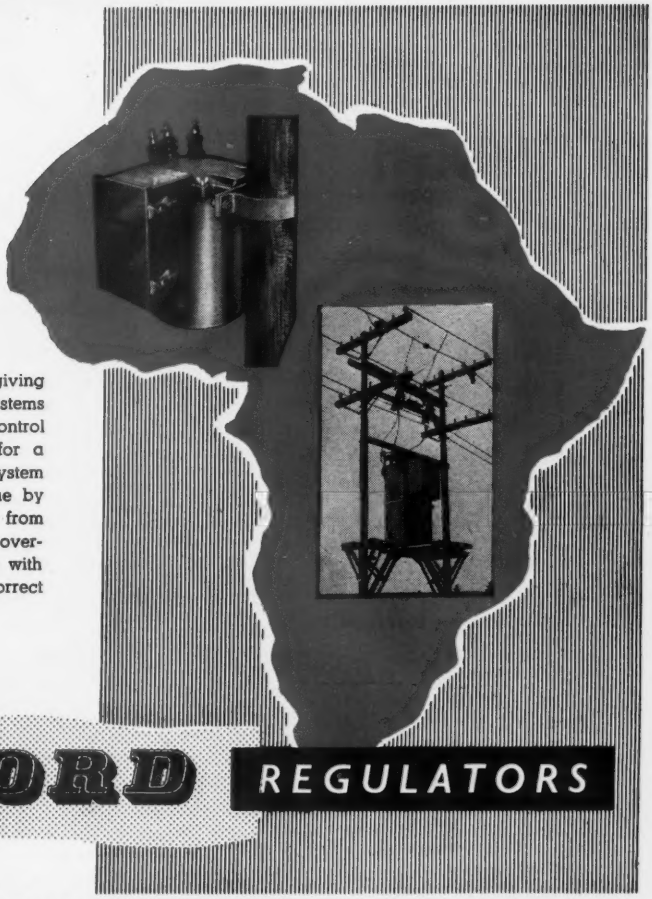

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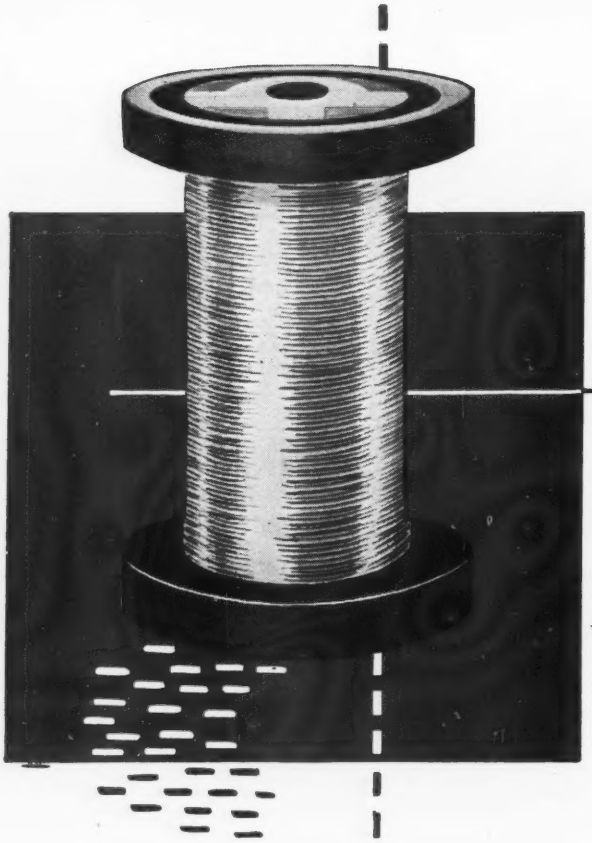

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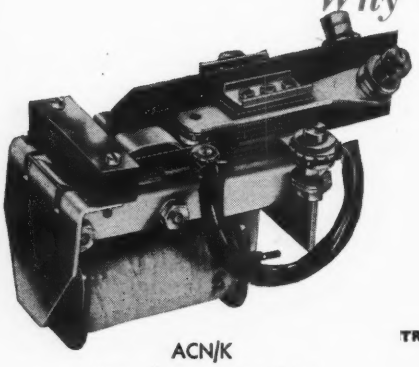

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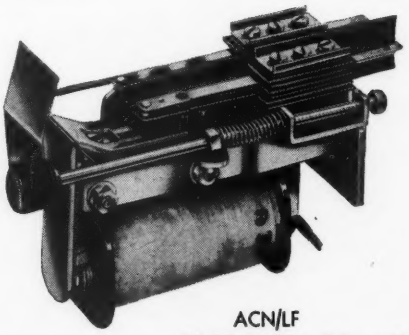

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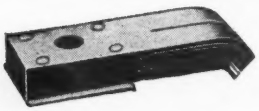

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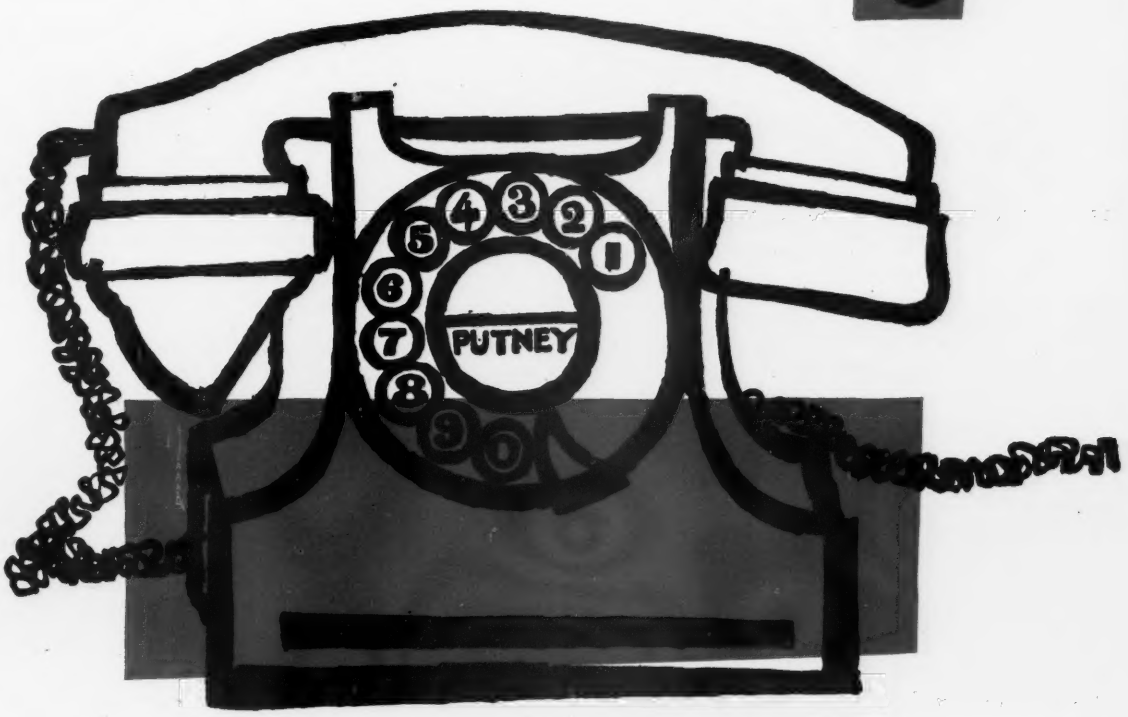

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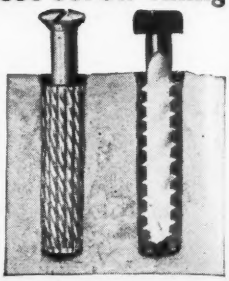

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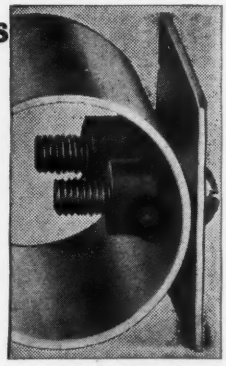

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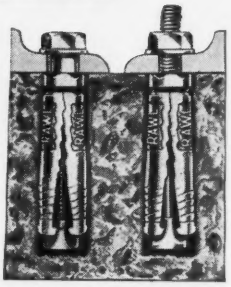

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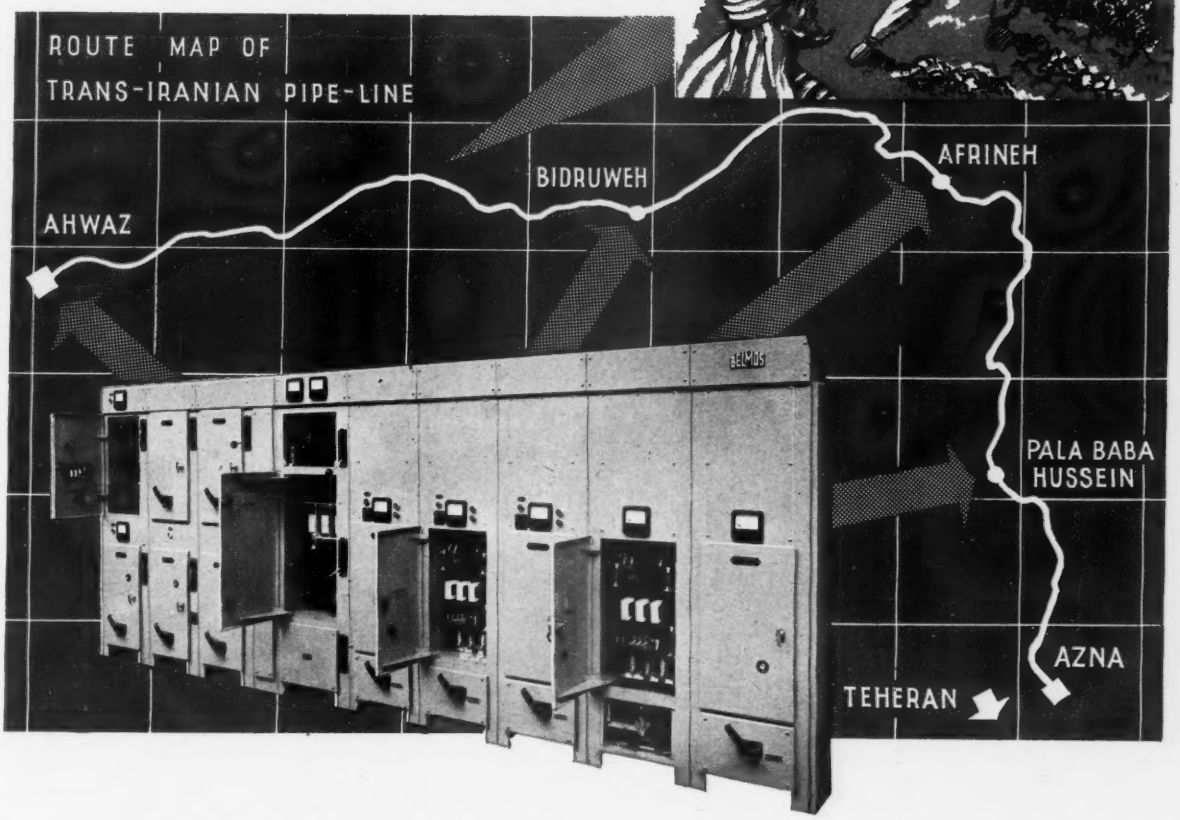

Running for 300 miles, the Trans-Iranian oil pipe line connects the town of Ahwaz (a focal point of the existing crude oil pipeline system of sixty miles north of Abadan), to the town of Asna, forming the southern part of a project which, in all, will stretch from Abadan to Teheran ; the line from Abadan to Ahwaz being already in existence, while the Northern section from Asna to Teheran is being laid by a French firm. The completed pipeline will cover some 580 miles and will convey Gas Oil, Kerosene and Motor Spirit.

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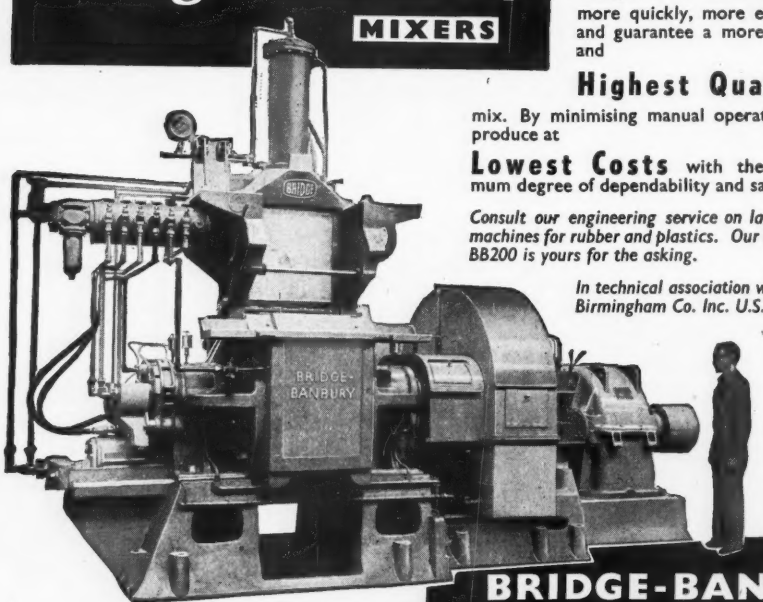

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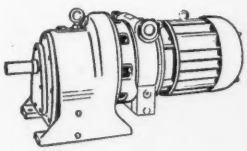
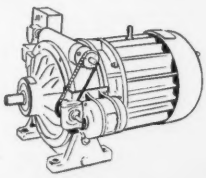
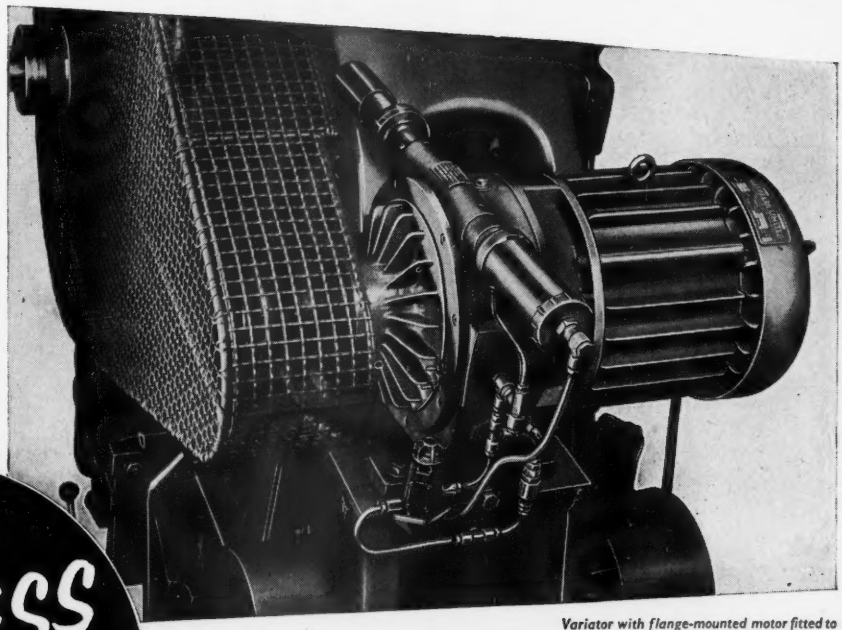
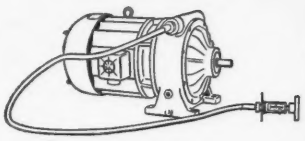






Variator with flange-mounted motor fitted to a 55 ton Horden, Mason & Edwards Ltd., Power Press

A GEARLESS GEARBOX *with the following advantages*



- ★ *Stepless speed variation over a 9 to 1 output speed range (1/3 to 3 times the input speed).*
- ★ *Constant horse power transmitted throughout the speed range.*
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- ★ *Standard range 1/33 h.p. to 15 h.p.*

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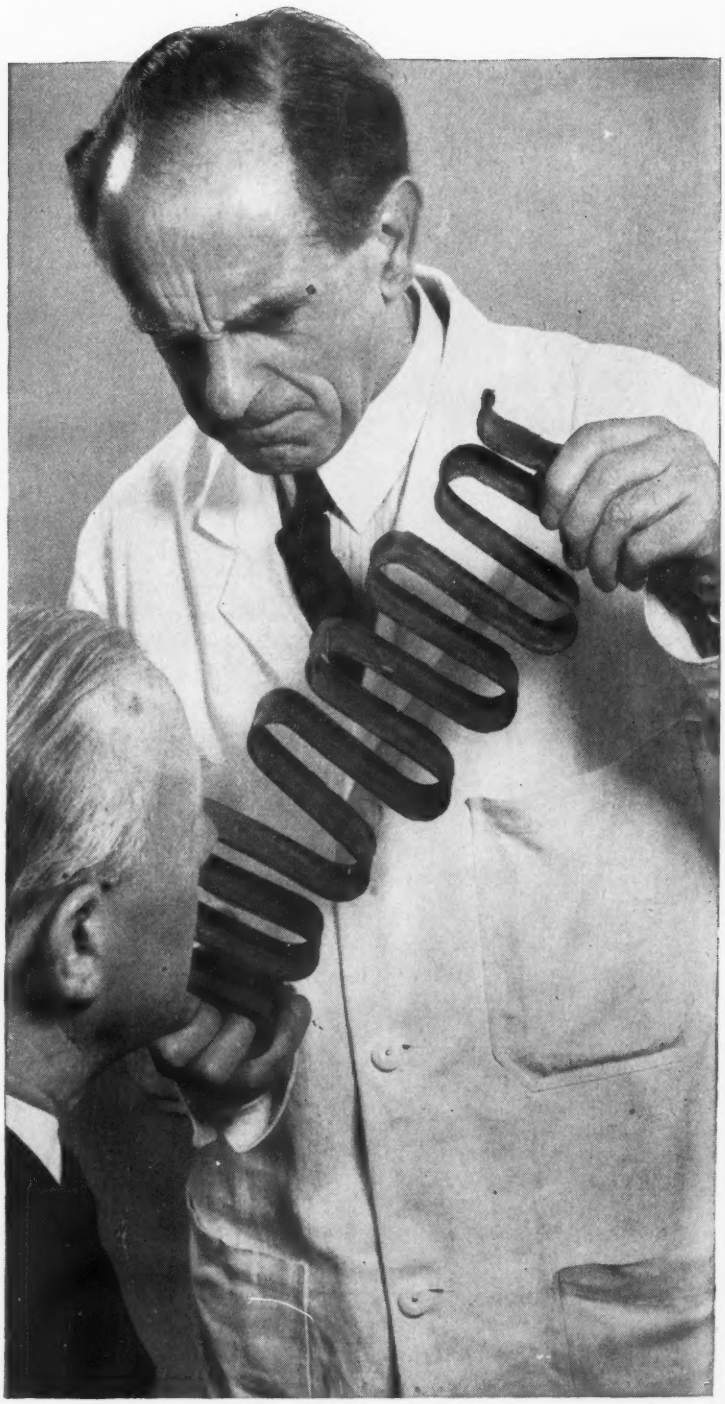
Mr. Finch is forbidding when he's roused



He's a quiet type normally, all wrapped up in productivity. But when his production line is brought to a standstill by the premature failure of a furnace element, in he rushes to the Buyer's Office. 'Look at this element' he says, and then it starts....

It's little use for the Buyer to protest that he only orders the elements—Mr. Finch is formidable in this mood and, of course, he's right. Correct choice of the most suitable resistance material would have ensured dependability and long life. That is why so many furnace manufacturers use one of the Brightray Alloys for their elements.

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ELECTRICAL RESISTANCE ALLOYS

Produced in the form of Rod, Wire, Strip and Tape

BRIGHTRAY C for intermittent heating up to 1150°C ...used in cookers, toasters, laundry irons, fires, soldering irons...

BRIGHTRAY B produced to provide a cheaper but satisfactory material for elements working up to 950°C.

BRIGHTRAY S for continuous heating up to 1150°C ...principally intended for electric furnace heating elements...

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WILCO-WIGGIN THERMOMETALS in many grades for thermostatic devices controlling temperatures ranging from −75 to 540°C.

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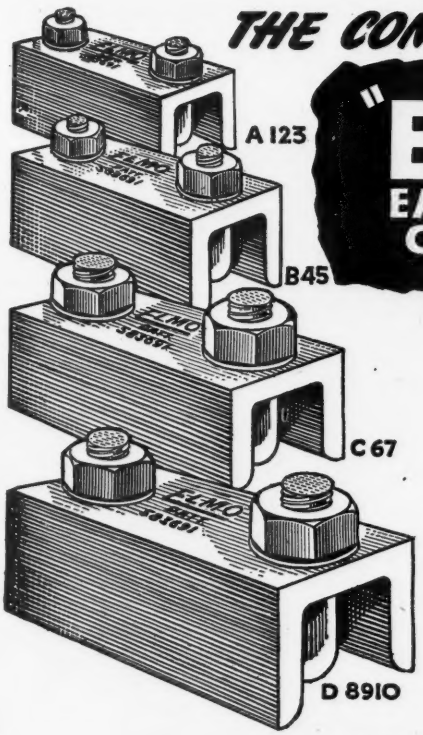
THE COMPLETE RANGE OF "ELMO" EARTHING CLAMPS TO B.S.951-1948

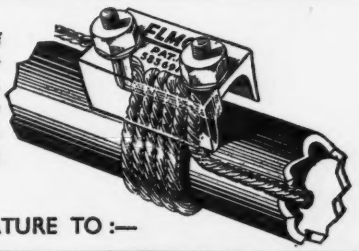
★robust • foolproof



	A123	B45	C67	D8910
for earthing cables up to	7/0.036"	7/0.064"	19/0.064"	19/0.083"
to fit B.S. conduit sizes	1, 2 & 3	4 & 5	6 & 7	8, 9 & 10
I.e. in trade terms	½" to ¾"	1" and 1¼"	1½" and 2"	2¼" to 3½"

NOTE ALSO: Type A123 is suitable for Earthing Cables up to 7/0.029" and for B.S. conduit sizes 1—5.

"Elmo" Earthing Clamps are of robust construction. Impossible for wire to pull out, always under tension therefore a most satisfactory earth and a permanent safeguard. Obtainable through all the leading wholesalers.



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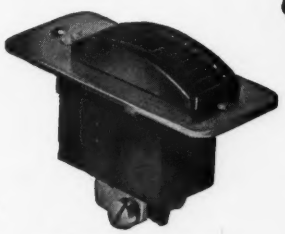
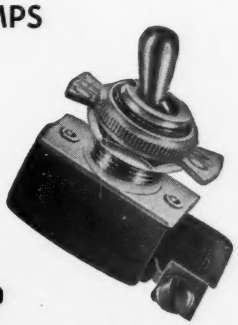


SLIDE THUMB SWITCH—S.645
3 amp., 250 volt



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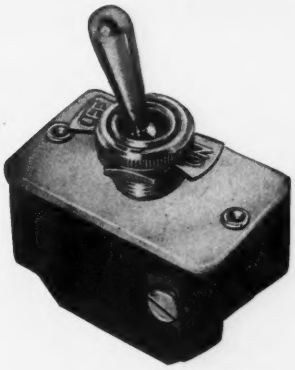

10 AMP. TOGGLE SWITCH—M.30
For electric fires

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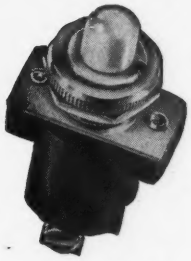

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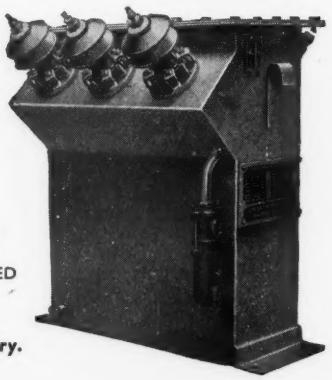

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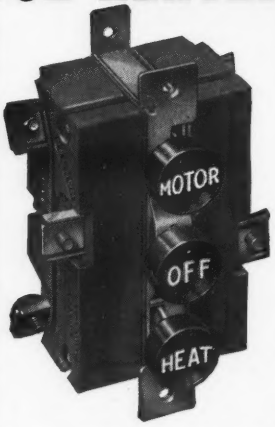

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A new Company - with a

The first incandescent electric lamp was demonstrated by Sir Joseph Swan in 1878; Thomas Edison also produced an electric lamp about this time. Together they formed The Edison & Swan United Electric Lamp Company. The first radio valve was later developed from an Edison Swan lamp by Sir Ambrose Fleming.

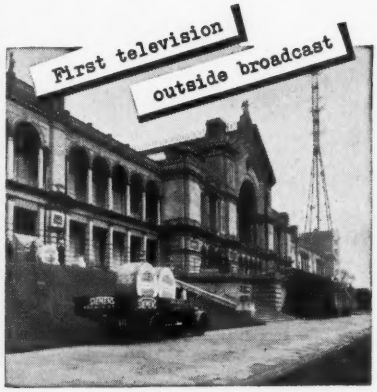
The first short magnetic cathode ray tube was a product of Edison Swan in 1935. The majority of television sets in use in Great Britain today are fitted with tubes of this type.

The first automatic trunk telephone exchange — installed by Siemens Brothers at Cape Town, South Africa, in 1934. Twenty years previously Siemens had installed the first automatic telephone exchange in Kings College Hospital, London.

A CENTURY OF PIONEERING AND ACHIEVEMENT

It was Siemens Brothers in 1927 who first equipped a vessel—s.s. 'Carinthia'—for short-wave marine radio-telegraphic service.

At Paddington Station, London, in 1934 the Great Western Railway installed a Siemens electrically operated train arrival indicator. The first of its kind in the world.



The first television outside broadcast was of the Coronation procession of King George VI in 1937. In co-operation with Electrical and Musical Industries, Ltd., Siemens Brothers made and laid the London Television cable which was used for this purpose.

Century of experience

Look back over the achievements of Britain's electrical industry during the past century and time and again you will find the names Siemens Brothers and Edison Swan occurring.

These are the companies who brought you the first incandescent electric lamp and the first radio valve; who pioneered the use of short-waves for marine radio telegraphy; who made the first electrically operated train arrival indicator and installed the first automatic trunk telephone exchange. Now they are united to form a major new enterprise – Siemens Edison Swan Ltd.

The setting up of this new organisation is a significant step forward in the history of the two companies – and for that matter in the A.E.I. Group to which they both belong – for it brings together two of Britain's oldest electrical companies in one streamlined research, manufacturing and selling unit organised to meet modern marketing requirements.

Many Siemens Edison Swan products are engineering products sold only to industry, the Services and Government Departments; but a few, such as electric lamps, radio and television valves, motor car batteries and domestic heaters are on sale in shops and garages.

Siemens Edison Swan is proud of the magnificent record of its forebears; and the fine tradition of quality and reliability which Siemens and Ediswan products have established throughout the years will be upheld by all products which bear the new trade mark.

As recently as 1956 it first became possible to telephone by cable across the Atlantic. Practically all the cable was made by Submarine Cables, Ltd. – a company jointly owned by Siemens Brothers and the Telegraph Construction and Maintenance Co., Ltd. More than half the trans-Atlantic telegraph cables have also been made and laid by Siemens.

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R.O. PALLETS are the "reel" answer

The London Electric Wire Co. & Smiths Ltd. of Church Road, Leyton, London, use thousands of miles of copper wire during a year.
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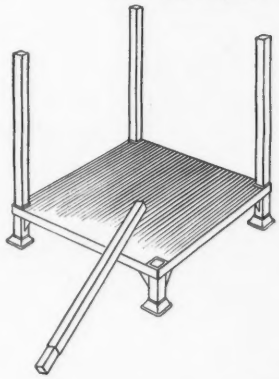

All four posts are removable. Extra ground clearance is provided for transport by stillage truck as well as fork lift truck.

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. . . a complete New range

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The all-insulated units are complete with their own self-contained mounting blocks and are ready to fix straight to the wall. There is an incombustible compartment to house the cables.

EASY TO WIRE!

The terminals are placed for easy wiring and are generously sized. Good earthing facilities are provided.

EASY TO LOOK AT!

The styling of these new units is modern and attractive. They are extremely compact and unobtrusive.

FLUSH UNITS COMING SOON!

A range of flush pattern switches will be announced in the very near future.

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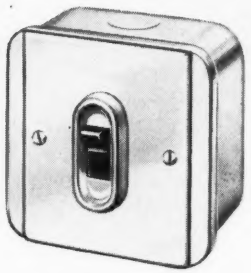

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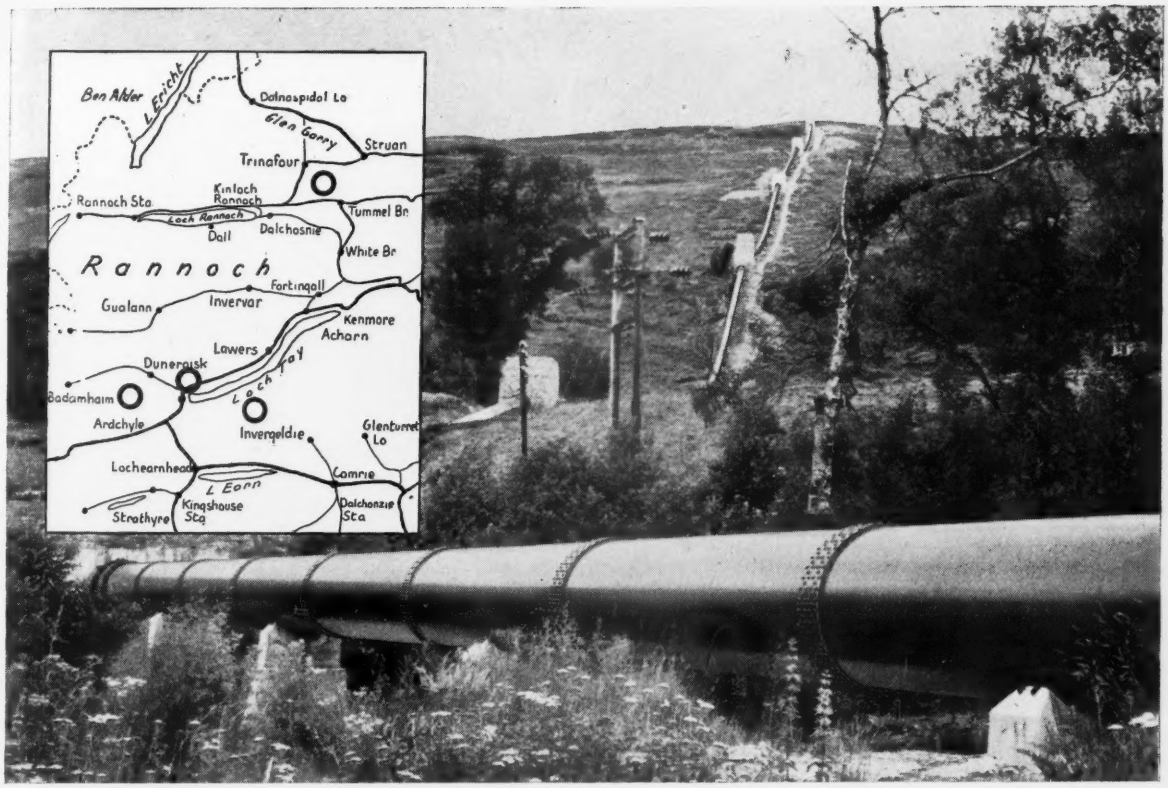

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Up at Lawers in Perthshire, and other places where pipelines of the North of Scotland Hydro-Electric scheme run, engineers have exploited the advantages of Tufnol for bearing pads to support the pipelines. Many of the pads have already given several years of satisfactory service for, due to its inherent physical properties, Tufnol is the ideal bearing material for pipelines.

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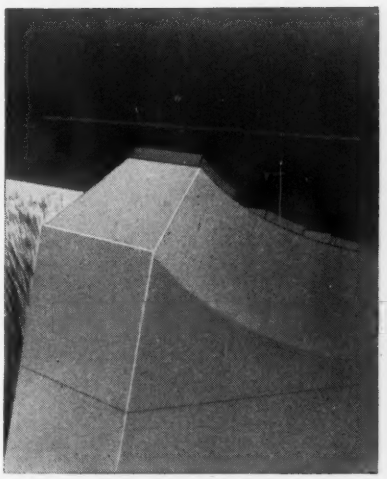

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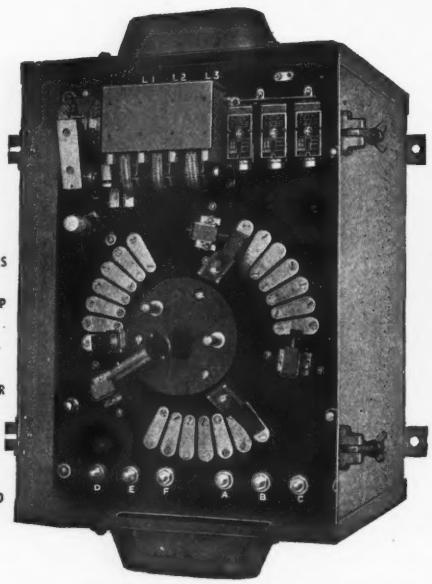

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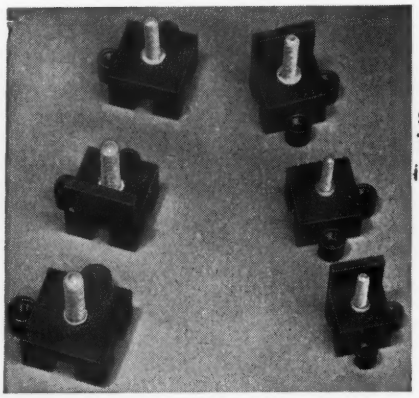

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Patented

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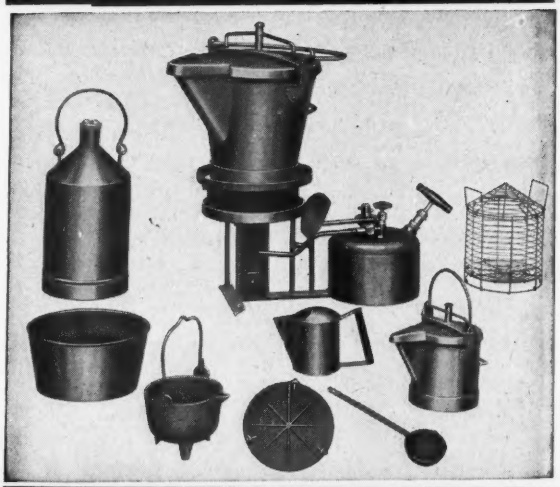

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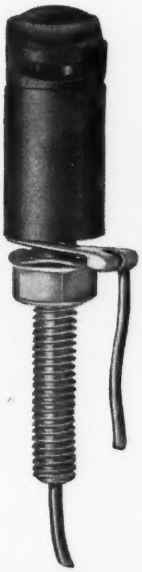

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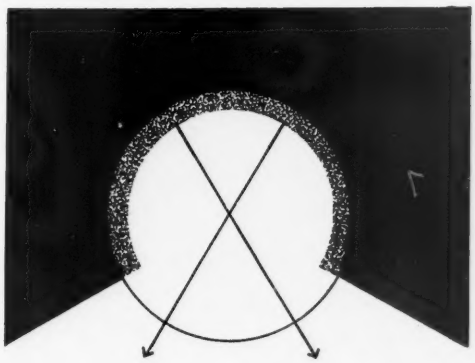

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5 JULY
1957

ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E. *General Editor:* J. H. COSENS *Technical Editor:* P. W. TUCKER, M.I.E.E.

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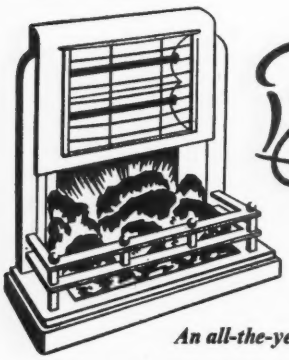

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ELECTRICAL REVIEW

5 July 1957 Vol. 161 No. 1 Established 1872

Under-Developed Countries

THE amount of electricity used annually per head of population is commonly regarded as providing a convenient indication of a country's industrial state, but it is only one factor. A notable feature of the recent Belgrade meeting of the World Power Conference, to which we refer elsewhere in this issue, was the endeavour made to relate this factor to others that are interwoven with it and are relevant to the economic advance of " under-developed countries " through a greater use of energy. The term " under-developed " here refers roughly to those parts of the world in which the average B.Th.U. consumed per inhabitant is only about a quarter of the average for industrialised countries and much less than that for some of them.

Improvement can come about only through heavy expenditure on generating and distributing plants well beyond the present economic capacity of these states. Moreover, the capital available would have to be shared with the new industries (including railways) that would absorb the increased electrical output.

Under-developed countries, however, have the advantage of starting at the present stage of technological progress, thus avoiding the slow evolution from elementary and often empirical techniques necessary where an earlier advance was made, although the practical turn of mind fostered in this way has its merits in regard to modern engineering problems. Another aspect is that an immediate aim of economically rising countries is to improve living standards, which seems to indicate that domestic electrification, for instance, will be more quickly off the mark than it has been in the West.

In the near future generation will no doubt be mostly by small units supplying somewhat dispersed populations at relatively high cost, though not so high as the cost of doing without. Present indications are that nuclear energy on a small scale and at low load factors will not be economic for many years to come. Developments in high-voltage transmission, especially direct-current, may make practicable the exploitation of hitherto untapped water-power resources, and thus provide the ultimate solution in many cases.

So far the position has been considered from the aspect of aid in materials and technical experience which can be given by more electrically advanced countries. At a later stage a tendency towards greater self-sufficiency in the manufacture of plant and apparatus might be expected. This tendency, in our view, is likely to be offset by the greater productivity of workers that this implies, since each yearly percentage increase in

this way has been accompanied by an appreciably larger percentage increase in the use of energy. Apart from the question of finance, such an increase would necessitate greater co-operation with countries possessing longer experience in the technology and manufacture of plant of complex design (including by then full-scale nuclear reactors) which would be needed to meet the electrical needs more nearly corresponding to the socially advanced circumstances.

TELEPHONE PROGRESS

A reduction in the waiting list for telephone connections from 372,000 in March, 1956, to 258,000, the latest figure announced by the Post Office, seems to indicate satisfactory progress, although some of the improvement may be due to a falling-off of applications because of the higher charges introduced in the meantime. But, according to the Telecommunication Engineering and Manufacturing Association, this country is still lagging behind many of the other leading nations in telephone development.

Statistics reproduced in the Association's 1956-57 report, reviewed in this issue, show that in terms of telephones per 100 of population the United Kingdom had 13·46 in 1956; the United States had 33·73, Sweden 30.44, Canada 26·28, New Zealand 24·61, Switzerland 24·27 and Denmark 20·05, while Hawaii, Australia, Norway, Iceland and Alaska were all ahead of us.

Although the manufacturers increased their exports last year by about 20 per cent to a total of £22 million, they were still able to produce more for home use and are ready to meet even heavier demands.

B.I.F. SUSPENDED

After representatives of the Birmingham Chamber of Commerce had interviewed the President of the Board of Trade last week it was announced that the Chamber had decided not to hold the British Industries Fair at Birmingham in 1958. It appears that the Chamber has come to the conclusion that if it is to be continued the Fair must become international in character and time is too short to enable a Fair on these new lines to be staged next year. It is regrettable that the only British exhibition with any pretensions to comprehensiveness should thus have to be suspended (if not ended), but from the electrical point of view regret is tempered by the thought that electrical representation had already dwindled to very small proportions.

At the interview Sir David Eccles placed the responsibility for the future of the Fair upon industrialists who, he said, would have to decide upon the question of internationalisation. But the Government also has some responsibility; the demise of the London Section of the B.I.F. was largely due to the withdrawal of official support.

HINKLEY POINT

Having secured consent to the use of the selected site at Hinkley Point, North Somerset, the Central Electricity Authority will now be able to go ahead with the third of its nuclear power stations which will add 500 MW to its generating capacity and cost between £60 and £70 million. The Minister's decision comes only five or six weeks after the public inquiry. In this the C.E.A. is more fortunate than the South of Scotland Electricity Board whose proposed nuclear power station site at Hunterston, Ayrshire, is still unavailable because of unfortunate delays since the first inquiry was opened last January.

Work is proceeding rapidly on the Berkeley (Gloucestershire) and Bradwell (Essex) stations which are being constructed by the Nuclear Power Plant Co. and the A.E.I.-John Thompson Nuclear Energy Co. respectively; the Scottish station is to be built by the G.E.C.-Simon Carves group. The English Electric Co. put in a tender for the original C.E.A. stations and it is generally understood that the contract for Hinkley Point will go to that concern. Since the first tenders went in a fifth group, including Richardsons Westgarth, International Combustion (Holdings) and Crompton Parkinson, has been formed.

AERONAUTICAL RESEARCH FACILITIES

With the building of the Royal Aircraft Establishment at Bedford this country has been equipped with facilities for aircraft research comparable with and in some instances superior to those available in other countries. For instance, the new 8ft by 8ft supersonic wind tunnnel described in this issue is the most powerful and complex in the country and provides our aeronautical engineers with testing facilities which are not available anywhere else in the world. Although the Bedford establishment is comprehensively equipped it is intended to be complementary to Farnborough, and the work done in the wind tunnels at both establishments is part of an integrated programme of aerodynamic research pursued by the R.A.E. as a whole.

When the 4ft by 3ft tunnel at Bedford is completed the R.A.E. will be equipped with an extremely valuable range of wind tunnels in which models of useful size can be tested from low speeds, through the speed of sound, up to a Mach number of 5. The design, manufacture and installation of all the complex equipment at Bedford has been achieved by remarkable teamwork between engineers, scientists and architects, the team being drawn from the Ministry of Works, the Air Ministry, the Admiralty, the Ministry of Supply and about seven hundred private contractors.

DEARER COAL

The latest increase in the price of coal has been justified (at least in its own eyes) by the National Coal Board, but it means a rise in the cost of everything else —including electricity. So far the Central Electricity Authority has been successful in counteracting coal-price increases to a very large extent by improved efficiency of generation, but how much more can it do in this way?

Whether the N.C.B. is entitled to demand so much for what is largely waste material is very doubtful. Its action will cause the C.E.A. to turn increasingly towards oil; it will certainly act as a spur in the construction of the nuclear power stations and, moreover, will help to bring the price of nuclear power more closely into line with that of coal-produced electricity.

NEW E.R.A. LABORATORIES

Inauguration by Lord Mills

THE new buildings of the British Electrical and Allied Industries Research Association at Leatherhead are now complete and occupied and on Wednesday of last week, 26th June, the Minister of Power, Lord Mills, officiated at the inauguration ceremony. The new premises were planned and designed by Mr. Herbert J. Rowse, F.R.I.B.A., of Liverpool, and comprise the main building consisting of standard functionally interchangeable laboratory units, together with library, photographic department, office and other special accommodation, the high voltage building, and the workshop building which includes also accommodation for a canteen. All buildings are of steel-framed brick construction.

The main laboratory building has three main floors and a mezzanine floor. It comprises a central section with two main wings on the same elevation and a third wing at the rear of the central section on the west elevation. The ground, second and third floors of the central section and its north and south wings are of normal height while a large part of the first floor accommodation has a height of 18ft, the remainder being covered by a mezzanine floor. Space is thus provided on the first floor for work requiring greater headroom and, at the same time, the mezzanine floor provides additional working space and an observation platform. In the west wing there are three floors of normal height.

The north and south wings provide space for twelve standard laboratories each 50ft by 35ft, while there are three similar units in the west wing, giving a total of fifteen laboratories excluding accommodation on the mezzanine floor.

The high voltage building consists of a central high voltage hall having a floor area of 100ft by 50ft and a height of 50ft, flanked by wings of normal height containing a transformer laboratory, generator room, instrument room, dark room and offices. The building is designed to accommodate a three million volt surge generator, a one million volt, 50 c/s test transformer set, a high-current surge generator, and high-voltage d.c. equipment, so covering the test voltages corresponding to the highest supply voltages at present used or contemplated.

Above : The new E.R.A. main building at Leatherhead

The single-storey workshop building has north lighting, and comprises a main machine shop and joiner's shop, together with small shops for heat treatment, forging, painting and other processes. To provide for expansion of workshop facilities as and when further development of the laboratories takes place, more accommodation was provided than is necessary to cater for present demands. A part has therefore been partitioned off for use as a canteen to serve the staffs of the laboratories and of the administrative offices at Thorncroft Manor. This enabled the provision of a separate canteen building to be deferred until a later stage. This building also contains the garage and maintenance department for the Association's vehicles, and provides some space for tests concerning ignition problems.

Electricity Supplies

The electrical installation was planned by the Association and carried out under contract by Messrs. Tanjon (Newcastle), Ltd. It has to satisfy different requirements from those which apply to normal industrial buildings owing to the varying needs of the individual working spaces. In addition to the 415/240 V main supply there are d.c. and locally generated supplies, which include stabilised 240 V single-phase, and single- and three-phase of variable voltage and frequency from machines in the generator room on the ground floor of the main building. Flexibility in distribution is essential and has determined the planning of the installation.

The main supply is taken and metered at 11 kV from the South Eastern Electricity Board who provided duplicate feeders to a separate substation. The E.R.A. switchgear comprises two oil-immersed fused switches, with provision for a third on the 11 kV side, each supplying a 500 kVA outdoor transformer. The 415/240 V switch-

board is in the same switchroom as the 11 kV fuse switches. Underground cables supply the main building, the high voltage building and the workshop.

In the main building the main switchboard is in a basement control room where the incoming 415/240 V supply is controlled by air-break circuit-breakers fitted with normal protection and remote tripping for emergency operation from outside the building. Sub-main boards, one for each wing, are supplied from the main switchboard and from the generator supply board (including d.c. battery supply) in the generator room. Distribution to rising mains for each wing is by main distributors run in a cable trench in the ground floor.

Ring Mains

From a board, situated adjacent to the rising mains in each laboratory, is run a 240 V single-phase ring main in wall trunking at sill level supplying socket outlets located at frequent intervals around the walls. In addition a plug-board is incorporated to connect any one of the special supplies to a number of similarly disposed socket outlets. Ring main socket outlets are of the 13 A type with fused plugs; special supply outlets are distinguished by the use of non-reversible two-pin 15 A plugs and sockets and the circuits are fused at the board. Provision is made on the board for three-phase supplies to some of the points in each laboratory and for local generators or auto-transformers used to supply the plug-board circuits if required.

In the h.v. building the incoming mains terminate at a main switchboard in the transformer laboratory. Special supplies taken from the generator room in the main building (direct current, stabilised 240 V single-phase alternating current and a spare four-wire circuit) are brought to the main switchboard. Distribution from this switchboard is to separate distribution boards for the supply and control of machines in the generator room and workshop, to socket outlets through wall trunking round the transformer laboratory and cathode ray laboratory and to socket outlets partly in wall trunking and partly in floor ducts to give convenient supply points in the testing area in the main hall of this building. In the transformer laboratory there are additional points for 100 A three-phase four-wire supplies.

The workshop building needs only 415/240 V mains supply, which is brought in from the substation to a switchboard with conventional incoming supply controls and distribution switches. Flexibility is achieved by overhead distribution trunking in the workshops. In addition 240 V single-phase ring mains are used to supply socket outlets suitably distributed in ancillary spaces, and canteen supplies are controlled at a separate sub-distribution board.

Heating

Off-peak electric space heating in all buildings is a feature of the installation. This causes the major load to fall outside normal working hours in the heating season. The main switchboard in each of the three buildings includes a separate switch or circuit-breaker for the heating supplies with a separate heating control panel.

Electric heating was adopted as the result of giving very careful consideration to all the technical and economic factors. Among these were the improvement of the electricity supply load factor afforded by a night-heating load, the advantage to the Association of ability to study a practical installation under its direct control, and amenity considerations.

It so happens that the three forms of off-peak electric heating—hot water storage, floor-heating and local block storage—are very appropriate in the respective buildings. The opportunity provided of obtaining continuous records and of correlating these with the thermal characteristics of the heated buildings is valuable.

The main laboratory building is heated by conventional radiators. The water used as heat distribution medium is heated at night between the hours of 9 p.m. and 7 a.m. by electric immersion heaters fitted into six 3,000 gal capacity heavily-insulated hot water storage vessels to a temperature of 250 deg F under the pressure provided by the height of the building (80ft). The thermal efficiency of the system is also increased by the low surface-to-volume ratio of the storage vessels since these approximate to spheres. All high- and low-pressure hot water mains in the heating chamber are insulated with three inches of asbestos-magnesia compound. The storage vessels themselves are covered with 3in of cork and 1in of asbestos-magnesia compound. As a result the temperature in the heating chamber is only about 70 deg F. Any number of storage vessels can be used at one time as required by the weather conditions.

Each bank of immersion heaters is loaded at 126 kW, making a total capacity of 756 kW. The supply is controlled by a panel containing contactors and relays, the main time switch for off-peak operation and a three-phase integrating kWh-meter. The hot water for the cloakrooms is heated by a separate immersion heater system controlled by the same panel, but its circuit does not include the kWh-meter and the time switch. A mid-day boost period from 1 p.m. to 3 p.m. is available but has not yet been necessary.

Maintenance of Temperature

The heated water circulates round the building only between 6 a.m. and 6 p.m. unless the air temperature in either the library or the general office falls below 55 deg F during the night, in which case circulation takes place. Two 1·5 h.p. circulating pumps are provided and used alternate weeks. The heat supply is modulated by causing the temperature of the water in the flow pipe to vary in conformity with the external ambient temperature, using a commercial device comprising an outside pilot fixed on the north side of the tower, and an internal relay system, mixing valve and thermostat. The temperature varies from 160 to 110 deg F for a range of external ambient temperature 30-60 deg F. Compensation for the extra cooling due to wind is included. The low pressure side of the system is protected from superheated steam by a fusible link.

Owing to the extended nature of the building complete thermostatic control is impracticable, but the heating surfaces are proportioned and arranged to take account of aspect and orientation. The mean air temperature acceptable is 67 deg F, and this is ensured by 9 a.m. by circulating the water from 6 a.m. to 9 a.m. at 160 deg F, whatever the external ambient temperature, to satisfy two air thermostats both set at that temperature and situated at the two internal control points mentioned above.

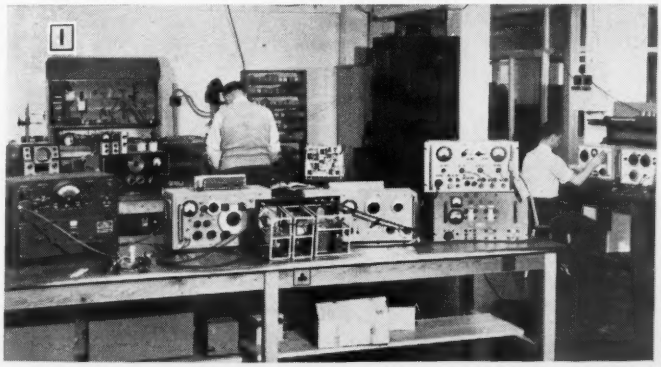
Temperatures in all rooms, the flow and return water temperatures and the external ambient temperature are recorded daily, and a monthly summary of costs is prepared. The calculated steady rate of heat loss of the main building against a temperature differential of 35 deg F (65-30 deg F) is 450 kW. The difference between 756 kW and 450 kW is provided to compensate for night losses, and also because circulation for twelve hours has to be provided by ten hours' heating. No circulation takes place on Saturdays.

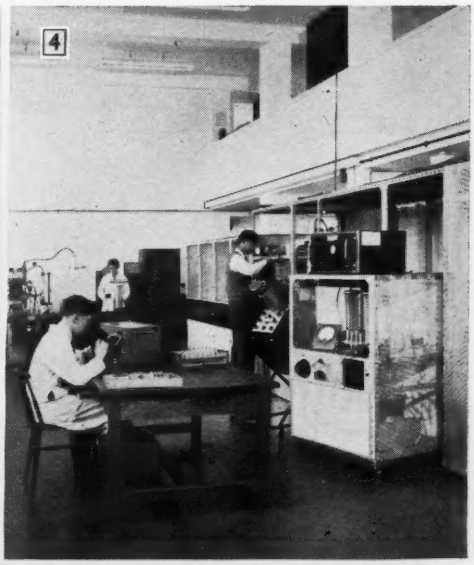
The high-voltage building poses a different problem, since the main hall is 50ft high with most of the equipment concentrated in the lower part where the staff usually

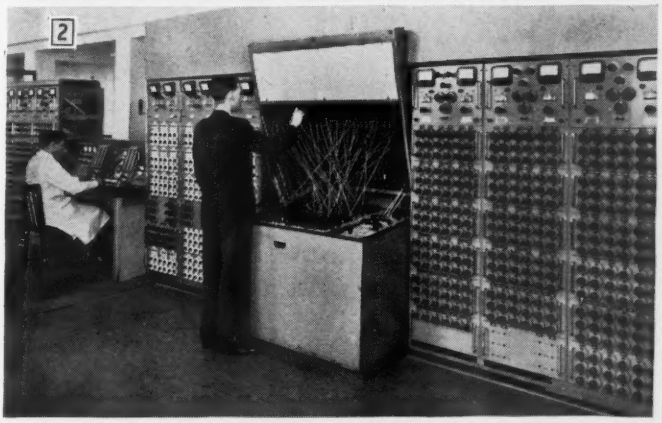
works; floor heating was therefore chosen. The heating is by electrical conductors threaded into ducts embedded in the concrete floor slab. The latter has heat insulation around the perimeter to reduce heat losses from the edges both above and below the floor level. It is divided into twelve panels, each controlled separately by wall thermostats with an additional external anticipatory control thermostat designed to take account of sudden weather changes. The system works from a central control cubicle which also contains measuring instruments.

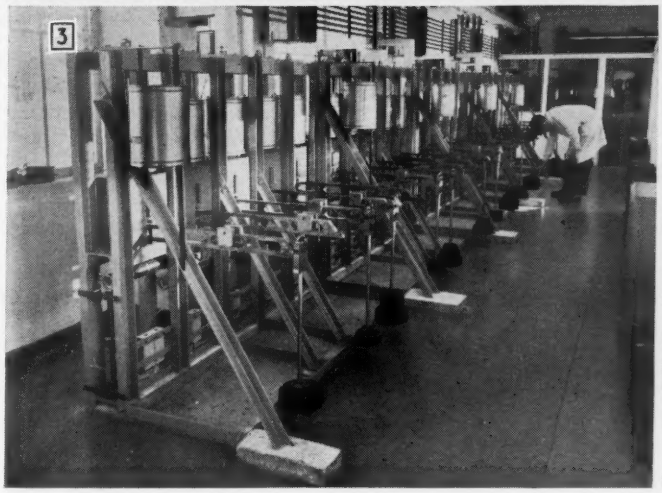
The whole of the workshop building, including the canteen kitchen but excluding the canteen, is also heated by buried electrical conductors in the concrete floor slab, as in the high-voltage building. In the canteen block thermal storage heaters are used. This latter installation is used for the investigation of methods of control, taking into account the off-peak supply conditions and the short periods of daily use. The heating systems were planned by the Association in conjunction with the contractors, Messrs. Richard Crittall, Ltd. (main building) and Panelec (Great Britain), Ltd. (high-voltage building and workshop).

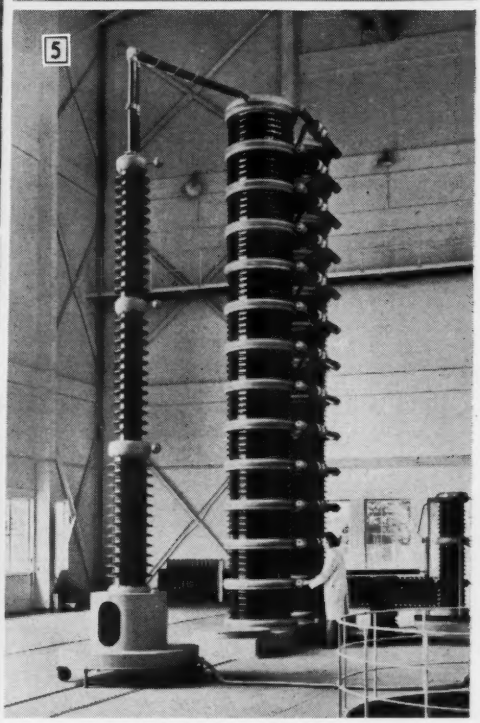
1. *The ignition and radio laboratory.* **2.** *When complete this network analyser will be as large as, and more accurate than, any other known to exist.* **3.** *Creep tests being carried out on high temperature steels.* **4.** *One of the insulation laboratories.* **5.** *The 2·8 million volt surge generator in the high-voltage building*

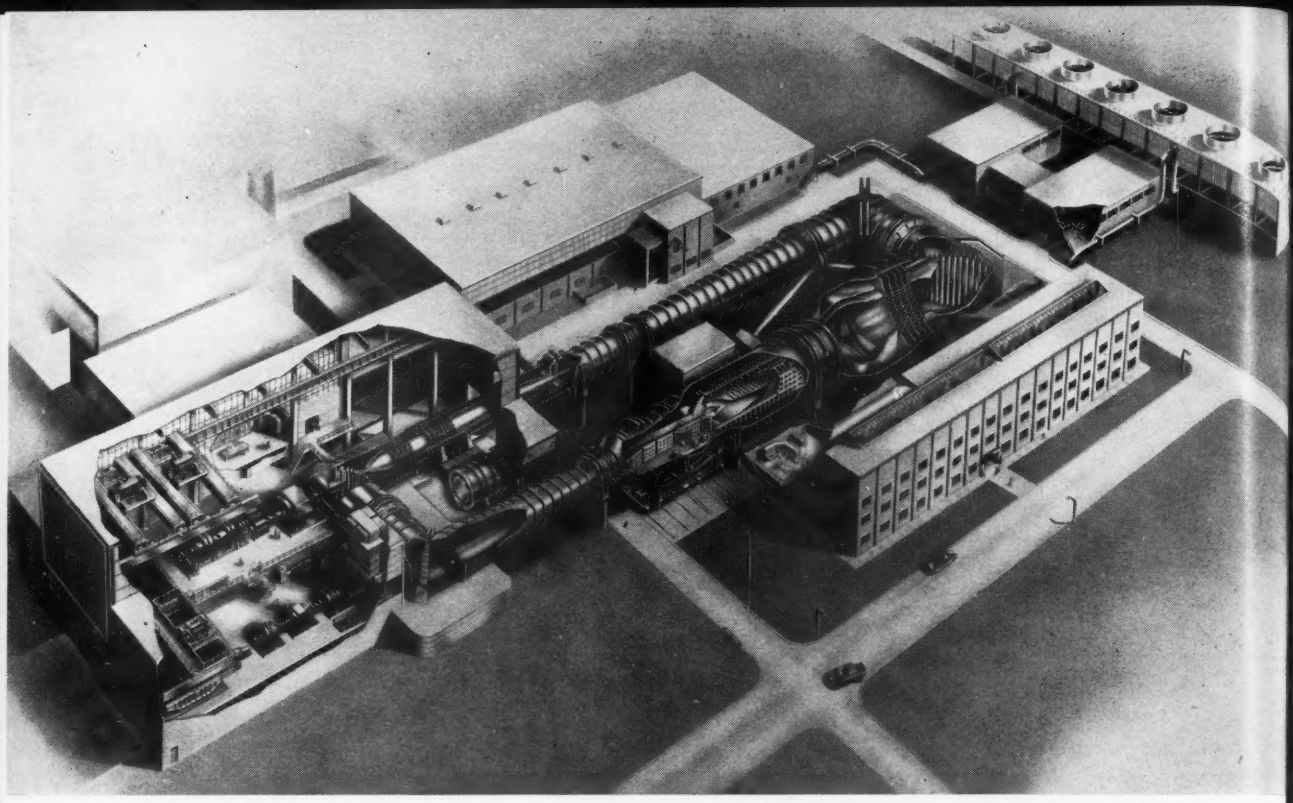












Electrical Review 5 *July* 1957

Royal Aircraft Establishment, Bedford

OFFICIAL OPENING BY MINISTER OF SUPPLY

THE rapid advance of aircraft performance brought about by the last war made it necessary for Great Britain, if she was to maintain her world position in this field, to extend considerably the existing facilities for investigating fundamental problems in aerodynamics and for model testing. This need was foreseen by the Aeronautical Research Committee when, in March, 1944, it submitted a report recommending the construction of a National Experimental Establishment for research and development work on the aerodynamic and structural aspects of aircraft design and on aircraft engines.

A site about 3½ miles north of Bedford was selected and design studies were started in 1946-47 and eventually embraced the following projects:—(1) A supersonic wind tunnel for Mach numbers between 0·9 and 2 (corresponding to about 1,500 m.p.h. at sea level) with a working section 3ft square, suitable for operation at air pressures between 0·1 and 2 atmospheres absolute and with driving equipment absorbing 16,000 b.h.p. (2) A high-speed laboratory with a 4,000 b.h.p. compressor installation and four test bays in which small supersonic tunnels can be installed for working sections up to about 9in square operating at Mach numbers up to 3 or 3½. (3) A vertical spinning tunnel, in the form of a cylindrical pressure vessel 80ft high and 46ft in diameter suitable for working pressures up to 4 atmospheres absolute. Within this pressure shell is a closed circuit wind tunnel which is driven by a 1,500 b.h.p. motor and has a vertical working section 15ft in diameter through which can be maintained an upward air velocity of up to 95 m.p.h. for observation of the behaviour of free models in spinning flight. (4) A general purpose low-speed atmospheric wind tunnel with a working section 13ft by 9ft and a speed range up to 200 m.p.h., driven by a 1,500 b.h.p. motor. (5) A supersonic wind tunnel for Mach numbers up to 2·8 suitable for air pressures from 0·1 to 4 atmospheres absolute, with a working section 8ft square and requiring over 90,000 b.h.p. to drive the main compressor and auxiliaries at maximum duty.

Above: General view of the 8ft by 8ft supersonic wind tunnel at R.A.E., Bedford

On 27th June the new establishment was officially opened by the Minister of Supply, Mr. Aubrey Jones, and on this occasion we had the opportunity of inspecting the wind tunnels, the electrical auxiliaries for which are both comprehensive and unusual.

Electric Power Supplies

A survey of the probable electric power requirements showed that although the base load and the medium-sized projects would be covered by a 30 MW supply, the ultimate peak load would probably be fixed by item 5 (the 8ft by 8ft supersonic wind tunnel) or possibly by another very large project (the 4ft by 3ft high supersonic wind tunnel) about which very little information was available at the time. Nevertheless, it seemed very probable at that time that the load of the 8ft by 8ft supersonic tunnel would be the largest single load which would have to be catered for and the requirements of this tunnel were therefore used as the basis of design of the power supply system.

An electricity supply of 75 MVA is provided from Little Barford power station at 132 kV, and is transformed down to 33 kV by the authority's transformer on the

Twinwood site. The transmission line includes two miles of 132 kV gas pressure underground cable terminating within the Twinwood site. A central substation has been constructed from which power is distributed at 33 kV and 11 kV (and in one particular case to suit ex-German equipment at 50 and 6 kV) to the various projects. Load dispatching to avoid the creation of excessive demands is exercised from this point.

Subsequently it was decided to proceed also with the installation of a variable frequency generating plant comprising two 20 MW gas turbine driven alternators generating at 11/2·2 kV and 50/10 c/s. These are now approaching the commissioning stage. Associated with this plant is a substation from which the variable frequency supplies can be made available to synchronous motor compressor drives.

The first wind tunnel project to be constructed at Bedford was the 3ft by 3ft supersonic closed circuit tunnel capable of testing models up to about 2ft wing span at Mach numbers from 0·9 to 2 and suitable for working pressures between 0·1 and 2 atmospheres absolute, with air drying, evacuating and charging plant. The installation is an adaptation of plant obtained from a German aeronautical research establishment. There are two single-stage, double entry, centrifugal compressors driven by d.c. motors each rated at 6,000 h.p. for 2 hr or 8,000 h.p. for 5 min. The compressor drive has been arranged with the two d.c. motors in the centre mechanically coupled and driving a compressor through speed increasing gears at each end, enabling the compressor load to be shared equally between the motors.

High-Speed Laboratory

The second project to be commenced on the site was the high-speed laboratory. In this case the requirement was to provide a compressor plant to drive small wind tunnels with working sections up to about 9in square at Mach numbers from 0·9 to 2 and suitable for working bays, together with auxiliary plant to dry the air, to evacuate and to pressurise the circuit within the range of 0·1 to 4 atmospheres absolute. A second requirement was to charge the pressure vessel of the vertical spinning tunnel (135,000 cu ft) with dry air to any pressure between 1 and 4 atmospheres absolute.

To meet these requirements there is a four-stage centrifugal compressor with an inlet volume flow of 20,000 cu ft/min and a pressure ratio of 4·2/1 at the top speed of 7,500 r.p.m. To provide maximum flexibility for work in the subsonic and transonic regions, a Ward-Leonard drive has been adopted for the compressor. This is operated through speed increasing gears by two d.c. motors in tandem, each developing 2,000 b.h.p. at 8,000 r.p.m., supplied at 0-525 V by two 1,620 kW generators driven by a synchronous induction motor. Compressor speed is continuously variable down to 10 per cent maximum speed with precision hand control of speed setting within 10 per cent down to 20 per cent of maximum speed.

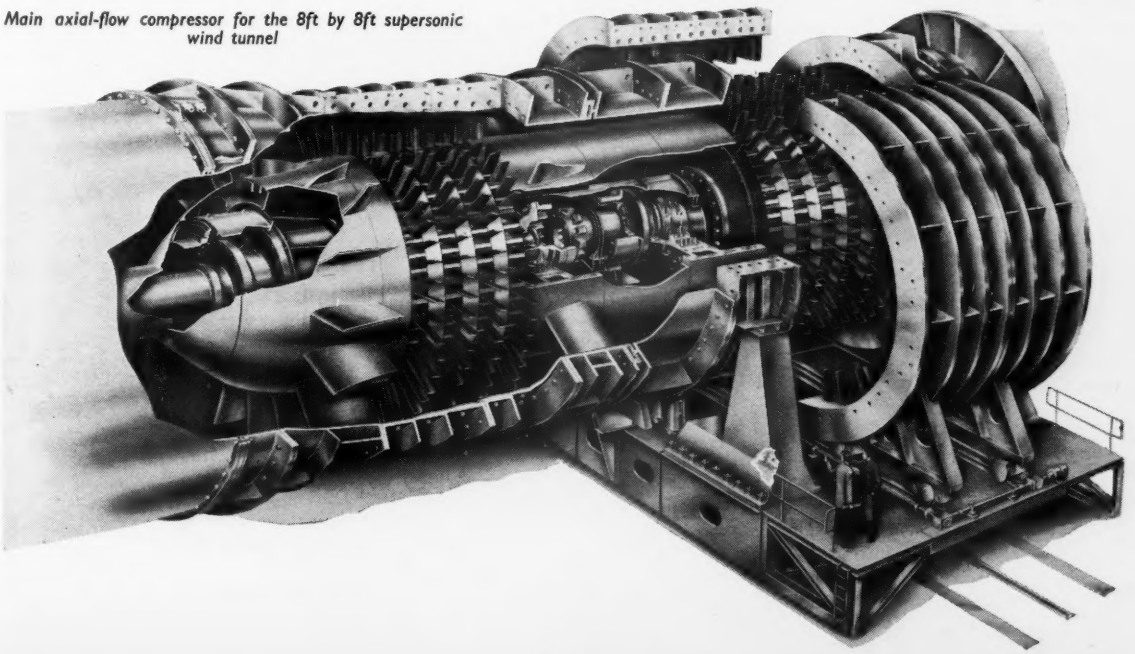
In addition to the central control position in the compressor room, full remote control facilities and instrumentation for the compressor and certain valves are provided from a control trolley with trailing cable which can be plugged into sockets provided in the four test bays. Automatic anti-surge protection, which is effective down to inlet pressures of 3 lb/sq in absolute, is provided for the compressor. An auxiliary compressor/evacuator set is provided for the purposes of evacuating, pressurising or maintaining pressure in the circuit constant against leakage. This is a two-cylinder, two-stage, double acting set driven at 415 r.p.m. by a 150 b.h.p. induction motor.

The vertical spinning tunnel permits free spinning and fixed rolling tests on aircraft models up to 7ft wing span with air pressures up to 4 atmospheres absolute. The pressure shell contains a vertical working section 15ft in diameter and 30ft high, through which an upward air flow is induced by an eight-bladed variable pitch fan, giving air speeds up to 95 m.p.h. For operation as a wind tunnel the design incorporates a variable pitch fan directly driven at 500 r.p.m. by a 1,500 b.h.p. 11 kV synchronous motor.

The low-speed wind tunnel is for testing the performance of high-speed aircraft at the lower speeds used for take-off and landing. It has a working section 13ft by 9ft for models with up to 9 or 10ft wing span and with a speed range up to 200 m.p.h.

The 30ft 8in diameter fan is driven by a forced ventilated d.c. motor, developing 1,500 b.h.p. at 1,100 r.p.m., through a hollow shaft 13ft 8in long and a spiral bevel gear box of ratio 3·37/1. The motor is supplied by a Ward-Leonard motor generator set at variable voltage

Main axial-flow compressor for the 8ft by 8ft supersonic wind tunnel



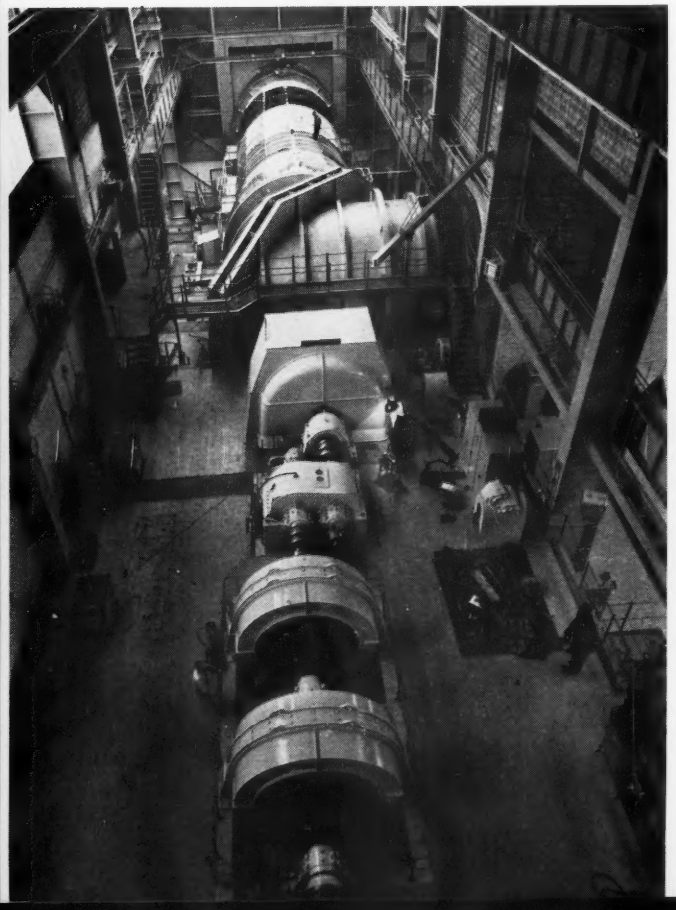
to give a range of 8 to 1. The generator voltage, and therefore fan speed, is controlled through a metadyne exciter which, in turn, can be controlled manually, by an electric constant speed device or by a manometer device giving a constant value of eV^2 in the working section, irrespective of change of model attitude. Remote control of starting, stopping and speed of the fan is available at the observer's desk adjacent to the working section.

The 8ft by 8ft high-speed tunnel which has just been completed, is the most advanced of its type in Europe, and it has some unique features. It is a multi-purpose, variable density, closed circuit, high-speed tunnel intended for use in developing high-speed aircraft, and is designed to cover both subsonic and supersonic speeds up to Mach 2·8. The tunnel is capable of taking models of aircraft up to about 6ft wing span, complete with control surfaces and of investigating performance under landing and take-off conditions as well as at supersonic speeds.

The tunnel structure which forms the closed circuit for the circulating air, consists of four horizontal legs, each of which is generally circular in cross-section. The two long legs are 350ft and the two cross legs are 60ft between centres. The diameter varies from 20ft at the inlet to the compressor to 47ft at the tunnel cooler. The duty of the tunnel cooler is to reduce the temperature of 1,200 lb of air per second from 160 deg C to 50 deg C and the air leaving the cooler has to have a uniform velocity and temperature (the target figure being ±1 deg C). The cooler is of the plain tube type with air passing through the tubes. The cooling water flows around the tubes in two double reversed flow passes.

The main compressor, which drives the air round the tunnel circuit, is the largest of its kind in Europe. It is a ten-stage axial machine designed to develop a pressure ratio of 2·63/1 with an inlet volume flow of 2,730,000 cu ft/min at a maximum speed of 750 r.p.m. The compressor is built in two sections—a low pressure section fixed permanently in position and having four stages, and a removable high pressure section of six stages. To give more efficient working at pressure ratios below 1·47 (corresponding to a speed of 1·6 times the speed of sound through the working section), the l.p. section only is used, the six h.p. stages being replaced by a dummy section. For pressure ratios of 1·47 and above, all ten stages are used.

Main drive building showing the motors, corner of tunnel, and l.p. and h.p. compressors



The main contractors for the compressor drive and generating plant were the English Electric Co., Ltd., who gave Brookhirst Switchgear, Ltd., the orders for the l.v. starters and control equipment for the auxiliaries.

Tunnel Compressor

The main compressor, which blows air through the closed circuit of the tunnel, is driven by a 68,000 h.p. synchronous motor and two 6,000 h.p. d.c. motors which are mechanically connected to the main motor shaft through a step-up gear box. The main motor stator is fed at 11 kV from the grid at 50 c/s or alternatively from 10/50 c/s variable frequency bus-bars supplied from two variable speed 20 MW gas-turbo-alternator sets. The d.c. motors obtain current from two 6 MW d.c. generators driven by a 14,000 h.p. a.c. motor, operating as a Ward-Leonard set. Speed control of the compressor is effected by adjustment of the fuel input to the gas turbines to vary the supply frequency to the main motor, and by alteration of the field excitation of the Ward-Leonard set. These adjustments are automatically controlled by electronic means. Motor-driven exciters and ventilating fans are provided for the above-mentioned machines.

The bearings of the main compressor and its driving motors, also the gear box between them, are supplied with lubricating oil under pressure. A comprehensive electrical interlocking system is incorporated to protect all main bearings and gear boxes against failure of lubricating oil pressure and excess temperature. A similar but smaller lubricating oil system supplies the bearings of the motor-generator set which provides Ward-Leonard control of the main d.c. motors.

At starting, the main compressor is driven by the d.c. motors only and run up to synchronous speed before the main motor is switched in. To reduce the starting load to proportions which the d.c. motors can handle, the tunnel is evacuated to 0·1 atm. absolute before starting.

The tunnel is evacuated to sub-atmospheric pressures by two two-stage (l.p. and h.p.) evacuators. The l.p. evacuator motors are each of 2,000 h.p. and the h.p. evacuator motors 635 h.p. A charging compressor plant is installed for tunnel pressurising and trimming compressor plant is provided for tunnel pressure adjustments. The two charging compressors may be operated either in series or in parallel and are driven by 1,635 h.p. and 1,730 h.p. motors whilst the two trimming compressors which may be operated either independently or in parallel are each driven by 380 h.p. motors.

The panel for controlling the wind tunnel auxiliary plant is in the auxiliary plant control room. This panel is over 32ft long and incorporates all necessary controls, indication and instrumentation for the evacuating, charging and trimming compressor plant, together with certain remote controls for the drying and refrigeration plant, main water pumps, cooling tower fans and tunnel control. This panel incorporates such items as temperature and pressure indicators and alarms, valve position indicators, water flow meters, annunciator panels and a mimic diagram.

British Plastics Exhibition

PREVIEW OF THE DISPLAY AT OLYMPIA

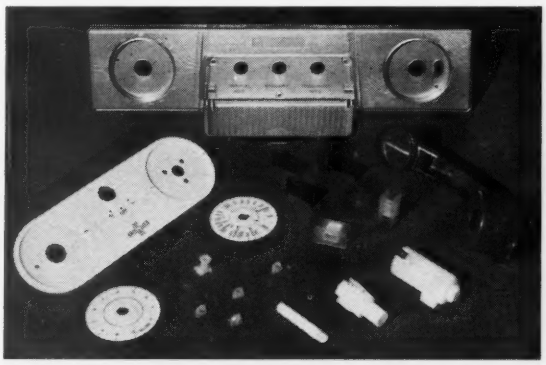
OVER one hundred manufacturers are taking part in this year's British Plastics Exhibition which is being held at Olympia, London, from 10th to 20th July. It will be open each week-day from 10 a.m. to 6 p.m. with an extension to 8 p.m. on Saturday, 13th July, and Wednesday, 17th July. Tickets of admission both to the Exhibition and to the Convention can be obtained free on request to the organisers, *British Plastics*, Dorset House, Stamford Street, London, S.E.1. The British Plastics Federation, which represents the plastics industry in Great Britain, will have an information bureau at the exhibition for the purpose of providing full information about the sources of supply of materials or finished products and also to answer technical inquiries.

Recent trends towards miniaturising equipment have opened another field for plastics. Lightness, compactness, and moulding to very close tolerances are all required, in addition to good electrical properties. Minute coil formers, sometimes wound with as much as a mile of wire, are common mouldings in sub-miniature work which is necessary for hearing aid equipment. Encapsulation (or potting) of circuits, particularly in polyester and epoxide resins, is now standard practice in the miniaturisation field.

Electrical engineers will find the equipment exhibited by Tufnol, Ltd., interesting, for example, bearing pads similar to those supporting the pipes in the North of Scotland hydro-electric schemes will be on view along with insulators for supporting the live rail on electric railways, a selection of Tufnol moulded bell, ball and barrel insulators for working loads of up to two tons and for working pressures of up to 660 V will be on show along with a variety of intricate punchings.

"I.C.I. Plastics in World Industry" is the theme of this company's Plastics Division exhibits. Applications in no fewer than 30 sections of trade and industry will be indicated. Products made from a wide range of materials to be shown include "Fluon" moulded components which are now being used in nuclear power stations. "Fluon" is claimed to be a very strong, extremely corrosion-resistant plastic which has a low coefficient of friction. The uses of "Perspex" and polyvinyl chloride in the electrical industry will also be illustrated.

Ashdowns, Ltd., are showing components made from "Ashlam" laminates and also a selection of thermoplastic lighting troughs. A material known under the trade name of "Vietum" being exhibited by Lacrinoid Products, Ltd., is an expanded p.v.c. tubing which upon application of heat will shrink back on to a rod or tube forming an acid resistant, hard wearing covering and giving insulation against up to 10,000 V with a 1 mm wall. This material is made in a range of colours in either transparent or opaque shades and is already in use for covering busbars, electricians' pliers, condenser covers, electric drills and guide stays for electric cables.

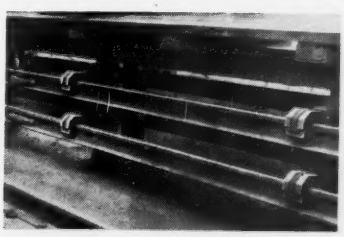


Engraved panels moulded in polystyrene, together with telephone handsets, bobbins and other mouldings, by Lustroid, Ltd.

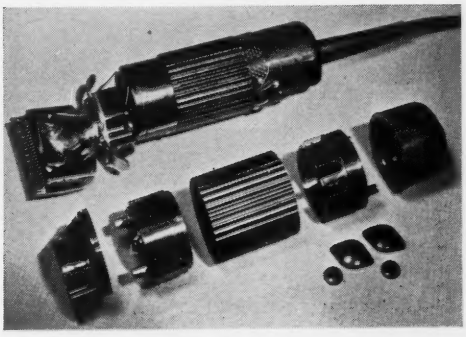
Scott Bader & Co., Ltd., are showing their "Crystic" and "Morco" polyester resins which are used for condenser encasing and electronic potting work. Various applications of their "Epikote" resins in electrical potting will be shown by the Shell Chemical Co., Ltd., who will be sharing a stand with their associates, Petrochemicals, Ltd., Styrene Products and Erinoid, Ltd. Styrene Products, Ltd., who manufacture six different grades of polystyrene moulding powder, will be exhibiting a wide range of products by various manufacturers who use this material, which has high insulation properties and can be used when the moulding in of metal inserts is required.

Among the exhibits to be shown by Wallington Weston & Co., Ltd., is an insulating board consisting of resin impregnated paper bonded to synthetic rubber which is used extensively in the manufacture of electrical condensers. "Meculon," which is a polyester film metallised with aluminium and possesses the advantage of being resistant to much higher temperatures than metallised paper, is to be shown by May & Baker, Ltd. This material provides thin films of metal and plastic in order to make up

Cable hanger coated with p.v.c. (Durable Plastics, Ltd.)



Tufnol insulators supporting the live rail on a quayside railway



Phenolic mouldings produced by British Plasticon Products (Birmingham), Ltd.

units of very small bulk for use in transistor circuits of miniature electronic equipment.

The display of materials by Bakelite, Ltd., will include phenolic laminates used for jigs, tools and gears, and a variety of electrical components. The electric clipper illustrated is a typical example of the part being played by the company's phenolic moulding material. These mouldings are produced by British Plasticon Products (Birmingham), Ltd., for Wolseley Engineering, Ltd., who manufacture the clipper. Some of the products made by Lustroid, Ltd., for the electrical and radio industries are illustrated. The picture shows engraved panels moulded in polystyrene, together with telephone handsets, bobbins and other mouldings. P.v.c. is now being utilised more and more as a protective covering for such items as cable hangers, switches, reflectors and conduit fittings where they are subject to extreme corrosion. Durable Plastics, Ltd., will be exhibiting an interesting range of items covered with this type of plastic coating. To be shown for the first time at this exhibition by the Siemens-Ediswan organisation will be examples from a wide range of p.t.f.e. and p.c.t.f.e. products. Possessing excellent electrical properties and chemical inertness under extreme temperature changes, p.t.f.e. is finding many unusual applications in the electronics, electrical and chemical processing industries.

Croxton & Garry, Ltd., will be exhibiting their "OMYA BSH" material which is a special filler used to improve the mechanical and electrical properties of natural and synthetic rubbers as well as p.v.c. compounds. They will also have available detailed technical information regarding the application of this material.

Ekco Plastics, Ltd., will show a selection of mouldings for many industries and a large variety of "Elo" technical compression, transfer and injection mouldings will be displayed by Birkbys, Ltd., a high proportion of which are manufactured by this firm for various branches of the electrical, electronics and telecommunication industries. "Elo" moulding materials are used predominantly in the manufacture of these mouldings, and the actual moulding tools are also designed and made by the company.

A range of electrical mouldings made from melamine for such items as terminal blocks, ignition distributor mouldings, etc., for use in aircraft will be shown by British Oxygen Chemicals, Ltd. This material is reputed to be highly satisfactory where good temperature resistance and anti-tracking properties must be combined with good insulation properties and strength.

"The Properties of Plastics" will be the theme of the display by the Distillers Plastics Group. A wide range of products made from synthetic resins and plastics materials manufactured by the companies in the group—British Resin Products, Ltd., British Geon, Ltd., and Distrene, Ltd.—is used to illustrate the many important properties of plastics. The display devoted to cellular p.v.c. is of special interest. Two types, open cell and closed cell, will be displayed together with end products which include insulation applications. In the refrigeration display there will be many examples of injection moulded and vacuum formed components.

The display by the General Electric Co., Ltd., will illustrate the versatility and scope of the company's mouldings which are used throughout industry. Examples to be shown will cover the domestic, radio and television, automobile and general and electrical engineering fields.

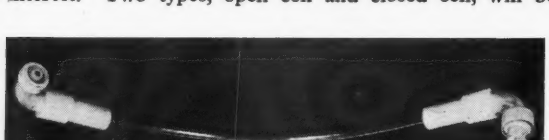
Mouldings

The chief exhibits of Litholite Insulators and St. Albans Moulding, Ltd., will be compression and transfer mouldings produced from synthetic resin powders of many grades. They will include mouldings for power stations and electricity distribution, couplers for charging battery-driven vehicles, switch parts, and a number of mouldings for incorporation into electrical busbar trunking systems and many other mouldings illustrating applications to industrial and domestic electrical equipment.

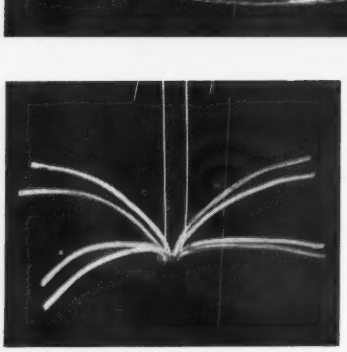
Products to be shown by Prestware, Ltd., include multi-pin plugs and sockets, magnetic relay mouldings of intricate design with small inserts moulded in melamine and phenolics. A wide range of electrical mouldings illustrating the excellent qualities of amino and alkyd moulding powders will be exhibited by British Industrial Plastics, Ltd. These electrical qualities will be demonstrated by submitting moulded pieces to the rotary arc test, the Nekol test, and the glow mandrel test. Hellermann, Ltd., are displaying thermoplastic mouldings for the electrical and allied industries, including their standard range of p.v.c. grommets and bushes, coil formers in polystyrene, bobbins in polythene and diakon, and feed-through insulators in nylon.

A wide range of plastic mouldings from the three factories of Insulators, Ltd., will include compression and transfer mouldings in all types of thermo-setting materials for the light and heavy electrical industries. They will also be showing mouldings produced in fibreglass polyester resin materials and a comprehensive range of nearly all thermoplastic materials.

Fuse puller made of "Tenite Butyrate" by Kodak, Ltd.



Above: Polythene-covered coaxial cable connectors for radar by Kent Mouldings

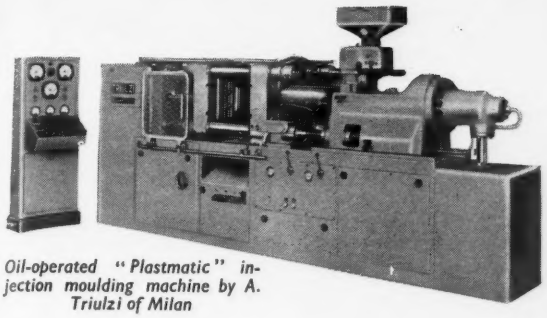


Left: The two vertical lines are Courlene (Courtaulds Polythene Monofil) used as a packing between the electrical conductors of a TV cable

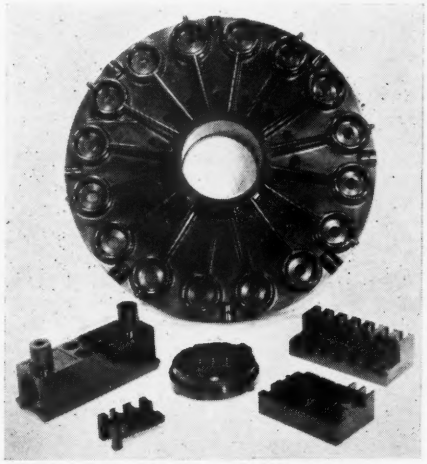
Injection Moulders, Ltd., will have on display a variety of mouldings produced in the usual thermoplastic materials for many firms in the radio, automobile, electrical and aircraft industries. There will also be an interesting display of the company's method of handling customer's products from the inquiry stage through their design unit, drawing office, toolmaking and finally the moulding division.

The "Simco" static eliminator, which is an improved apparatus for the elimination of static on all plastic, converting and printing machines, will be demonstrated on the stand of Sheridan Croxted, Ltd. Results claimed are maximum production efficiency, no sticking together or flying apart of materials, no winding round rollers or clinging to parts of the machine and docile delivery with very low current consumption.

Cosmocord will be showing mouldings for both domestic



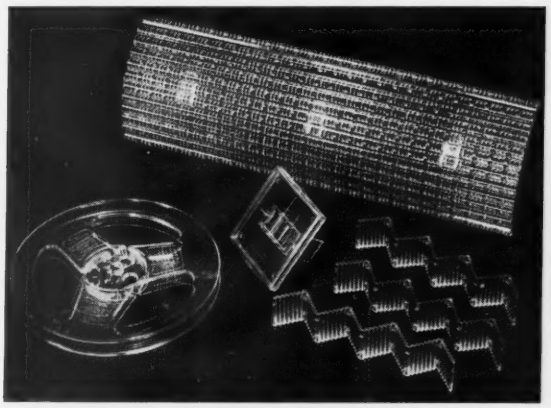
Oil-operated "Plastmatic" injection moulding machine by A. Triulzi of Milan



A selection of mouldings by Birkbys, Ltd.

and industrial equipment, their exhibits ranging from hair dryers to frying pan handles in the domestic field and from meter cases to components for aircraft in the industrial field. Mouldings made from many different materials for communication equipment, electrical engineering and the radio and television industries will be shown by Kent Mouldings. These include mouldings for Yagi aerial harness, comprising T-jointed coaxial cables, the joints being covered with moulded polythene. Another interesting feature in connection with cables will be the use which is being made of a material known as "Courlene," shown by Courtaulds, Ltd. "Courlene" monofils are being used largely as core or spacer threads in television cables. In addition the company will be illustrating the applications of "Courlose" sodium carboxymethyl cellulose, which can be used in wet, dry battery systems as a thickening or pelleting agent.

Prominent in the display by Mersey Cable Works, Ltd., will be the recently introduced "Merad" irradiated polythene insulated wire; other features will include "Merflon" tapes and sleeving and a wide range of p.v.c. and polythene insulated cables. They will also be showing research equipment used in the company's long-range development work into dielectric materials. Exhibits by Lorival Plastics will include washing machine agitators, hard rubber battery cases and a display of extrusions such as electrical conduit in p.v.c. Kodak, Ltd., are showing their "Super Gripper" handlamp guard, a completely insulated protective cage which fits over the top of a handlamp and is moulded from "Tenite Butyrate." A variety of "Perspex" fluorescent lighting reflectors and diffusers will be shown by Suntex Safety Glass Industries, Ltd., including a range of acrylic tubing which is now being used on a larger scale for tubular lighting fittings.



Variety of mouldings produced by Injection Moulders, Ltd.

Several firms will be showing examples of machinery used in the manufacture of plastic components, including moulding, extrusion, welding and grinding and mixing machines. On the stand of Dowding & Doll, Ltd., for example, will be the latest model of the Series II Dowding automatic fast cycling injection moulding machine. This machine has been developed for rapid production of accurate, high quality mouldings up to 30 grammes, and will handle any thermoplastic materials in common use. A machine of modified design will be shown producing mechanical components in nylon. Ankerwerk (Germany) will have their S.E.50/75 injection moulding machine on show as well as the DV 10/50 machine which uses a single screw plasticising and injection unit instead of the normal plunger injection unit.

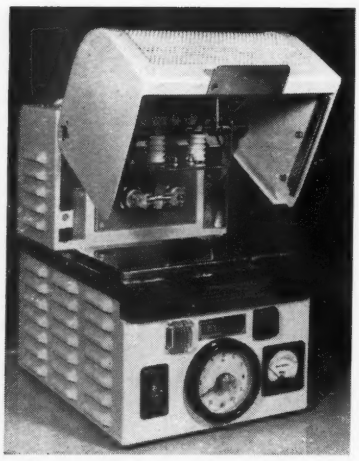
A. Triulzi (Italy) are displaying oil operated "Plastmatic" presses, having injection capacities of 7 and 1½ oz respectively. These machines are completely self-contained, including hydro-pneumatic accumulator, which assures fast operational cycle and high injection speeds. The injection pressure is adjustable independently of the locking force. All machines are equipped with fully automatic control gear.

On show for the first time on the stand of George Ellison, Ltd., will be a new solenoid operated hydraulic valve which is particularly suitable for working in conjunction with timers to give an inexpensive yet efficient form of automatic control of moulding presses. Existing presses can be converted without the need for any great capital outlay. B.I.P. Tools, Ltd., are showing typical examples of all kinds of moulding tools, including compression, transfer and injection. The mains-frequency induction heating system for moulds, which is used both as a standard method and offered as a service to other toolmakers, will also be shown. Included among the exhibits by Peco Machinery Sales (Westminster), Ltd., will be a control cabinet of unit construction which has been designed to control individual machine functions, such as die control injection, power operated cores, power operated ejectors, etc.

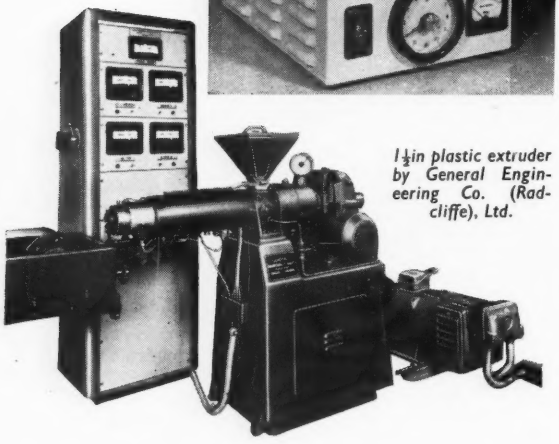
Extrusion Machines

Four new injection moulding and extrusion machines and various other items of general production equipment will be exhibited on the stand of R. H. Windsor, Ltd. Five of the twenty machines to be shown by Milford-Astor, Ltd., will be seen for the first time. Using a dry printing process, these machines are for decorating plastics and multi-colour imprinting and are suitable for moulded articles either flat or shaped, extrusions, sheet, Bakelite, etc. In the electrical trades they are suitable for such items as terminal plates, instruction panels, printed circuits, dials and moulded knobs.

A number of firms will be showing extruders. The Burtonwood Engineering Co., Ltd., will have a thermoplastic extruder complete with take-up equipment for cable and a caterpillar type haul-off used in the cable and general plastics industry. Included in the range of machines to be shown by T. H. & J. Daniels, Ltd., will be the Pasquetti



Radyne model H.3, 300/400 W plastic pre-heater



1½in plastic extruder by General Engineering Co. (Radcliffe), Ltd.

2VO extruder, which is the smallest of the Pasquetti twin-screw types for thermo-plastic materials; it will be shown complete with a tube die for rigid p.v.c. water cooling bath and take-off equipment. The current range of extruders manufactured by the General Engineering Co. (Radcliffe), Ltd., includes 1½in, 2½in, 3½in and 4½in for the extrusion of thermo-plastics such as acetates, styrenes, polyethylenes, vinyls and nylon. The 1½ and 3½in machines will be exhibited.

Plastic sheet welders, from small portable generators with 300 and 620 W output respectively, which can be connected by flexible cable to small presses or hand welding tools, and to large press welders of up to 20 kW output specially developed for bonding upholstery, will be shown by Radio Heaters, Ltd. A range of welding equipment by Körting (Germany) includes a high frequency welding unit, Fixus G 650S, for the welding of small and medium sized articles of p.v.c. and Durethan foam. The linking up of a second press to the generator offers great advantages for production in series. One press may be used for welding and the other one for embossing the product with colour or metal foil. The welder is provided with means for quick and accurate adjustment and speedy change-over of the welding electrodes. To ensure a reliable time control of the welding cycle, the company has developed highly perfected time switches either mechanically operated or motor driven.

Radio Heaters, Ltd., will be displaying for the first time a range of new high productivity pre-heating equipment for the thermosetting compression moulding section of the plastics industry. The new pre-heaters all have a high power output and are capable of much faster pre-heating cycles than the old ones. Among the new equipments in the new Radyne range is a small 300/400 W unit which is not very much more costly than the traditional infra-red oven, which it supplants. Induction heated equipment displayed by Beanwy Electric, Ltd., will include platens for compression moulding presses, equipment for installing direct into moulds for compression and injection moulding, and induction heaters for use on injection and extrusion machines. The company will also have on view a new machine for pre-heating thermosetting materials in pellet form, and will show in prototype form press guards and electric relays operated by a beam of light falling on a photo-transistor.

Mullard, Ltd., will be showing a 4 MeV linear accelerator which will demonstrate that certain plastic materials can be hardened by electron irradiation. They will also have on view their film scanning particle analyser, type L.188; this is an extremely flexible and comprehensive equipment for the rapid and accurate counting and sizing of small particles.

A range of disintegrators, grinders and powderisers in small and large sizes on the stand of Industrial Plastics, Ltd., will include the company's lump cutters which will break down even the largest blocks and lumps in one operation. There will also be a new triple-screw compounder known as the "Mixtruder," a machine which it is claimed combines the advantages of the batch blending method (Bridge Banbury type) and the continuous extrusion method of the general standard single-screw machines. Machines for mixing and kneading will be shown by Buss, Ltd. (Switzerland), whose "Ko-Kneader" (Type PR.200) with granulator and laboratory "Ko-Kneader" (Type PR.46) can be used for the continuous mixing and kneading of all thermo-plastic materials, as well as for the kneading and densifying of thermosetting moulding powders, both urea and phenolic.

The Morton Machine Co., Ltd., of Wishaw, Scotland, has a new machine, the FKM.150 DK Lödige-Morton mixer, for plasticising powders such as p.v.c. and p.v.a. for the "dry powder method" or "dry blend," which will handle 300 lb of plasticised powder per hour and is suitable for discharging continuously directly into the feed hopper of an extruder. These machines are being built under a manufacturing licence from Germany where several firms are already employing this dry powder technique, which obviates the necessity of using mixing mills and calenders.

Smoke Abatement Exhibition

PROMPTED by the intention of some South London local authorities to promote smokeless areas, the Southern Sub-Area of the London Electricity Board organised a smoke abatement exhibition at Sydenham recently. The exhibition was open for five days during which it was attended by nearly 200 councillors and local government officers, apart from other visitors.

The attention of visitors was first directed to exhibits provided by the National Smoke Abatement Society and some interesting examples were shown of the effect of smoke on London buildings.

The L.E.B. exhibited a range of appliances which were briefly described in a small brochure, a copy of which was given to each visitor. Quite a large section was devoted to electric floor warming and sectionalised models portrayed both "buried" and "rewirable" systems. In respect of the former an example using mineral insulated cable gave a detailed explanation of a method of laying including special tools developed by the Board's staff for the purpose. Side by side with the floor warming was a range of thermal storage block heaters. Two wall charts showed in graph form how both these systems of off-peak heating give a very close control of interior temperature.

Also on view were examples of electric clothes drying units, one being installed in a replica of the drying cupboard now being provided for tenants in Lambeth and other municipal housing schemes. One of these appliances was the "Lambeth" 1½ kW convector, a pattern specially developed to meet housing needs and incorporating a glass sheathed insulated element. Some hundreds of these are already in use in Lambeth flats.

Washboilers, electric fires of all descriptions and water heaters were also shown.

VIEWS on the NEWS

By REFLECTOR

IT is interesting to learn from the *Electrical Power Engineer* that friendly and helpful discussions have taken place between representatives of the Electrical Power Engineers' Association and of the Association of Managerial Electrical Executive with a view to the possible amalgamation of the two bodies. The A.M.E.E. had its origins in the Associated Municipal Electrical Engineers which had as its aim the maintenance and improvement of the status of its members in the days before nationalisation. After nationalisation, the scope was widened and the name was changed: to retain the initials the present rather strange style was adopted on the initiative, I believe, of the late F. W. Purse who was active in the A.M.E.E. It is a sign of the altered times when what used to be in a sense an organisation of employers contemplates amalgamation with what has always been an employees' association.

* * *

This reminds me that last week the *Electrical Review* reported that the Association of Supervising Electrical Engineers, which is essentially an employees' organisation, proposes to admit employers to membership. If this sort of thing goes on we can look forward to Mr. L. C. Penwill becoming a member of the E.T.U. one of these days.

* * *

A writer in the *Observer* wanted to know why it was that refrigerator doors were hinged on the right rather than the left. I wondered myself, and still wonder if an explanation given by a correspondent is the real one. He says that the doors are hinged on the right because they are rather heavy and food containers are light enough to be handled with the left hand, whereas with cookers the door is lighter and hot food utensils need the right hand. He goes on to say, however, that at least four manufacturers will now supply left-hand hinges on certain models.

Commenting on the same article, Mr. L. C. Penwill protests against the author's assertion that refrigerators are best serviced by the manufacturers or Gas and Electricity Boards. He points out that there are thousands of private electrical traders who are fully equipped and technically able to do this work.

* * *

The story of the electric railway commences with a model made in 1834 by a self-taught American village blacksmith from Vermont in the Green Mountain. It was a circular miniature railway 2½ft in diameter, having a locomotive with a fixed field magnet below, and a revolving armature above, through which current was reversed twice in every revolution. The name of the inventor was Thomas Davenport and he refused an offer of $250,000 for his invention in New York. He brought his model to England and while Michael Faraday was well pleased with it he would not recommend it for investment. My correspondent who delves into the past says that not long ago the first set of plans for an electric railway of the mountain type was discovered. They were made by Major Alexandro Bessolo, of the Sardinian States Artillery, who was then living at Turin. It was he who devised the overhead conductor with the rail return and a rotary electric motor in the car. The plan was for a mountain railway in the Alps on the rack-and-pinion principle of Silvester Marsh, with a centre rack between the rails to establish adhesion of the train and an overhead conductor to supply the electric power. Major Bessolo, whose project was not carried out in his lifetime, was a friend of William Thomson, afterwards Lord Kelvin. He obtained Thomson's advice on his plans at a joint holiday meeting at Portrush, Ireland, in 1857.

* * *

"*Son et Lumière*," a combined floodlighting and public address system applied to buildings of historic interest originated in France. It is now being adopted here at the Royal Naval College and the Queen's House, Greenwich, under the auspices of the Ministry of Works. The arrangements are in the hands of M. Paul Rober-Houdin, the creator of the spectacle, who describes the show as "a ballet of light and sound":—

> "It dramatises with lighting effects the various parts of a historic building, while music, narrative and dialogue are broadcast through a stereophonic sound system. The sounds are intended to suggest the presence of actors."

This is not the first application in this country to be announced. Two or three weeks ago Thorn Electrical Industries stated that the treatment was being accorded to Woburn Abbey, the Duke of Bedford's place.

* * *

Some notes on the social side of the Sheffield Convention of the Incorporated Municipal Electrical Association appeared in the *Electrical Review* of 5th July, 1907, and I give the following extract:—

> "We wasted much valuable time—and money, too—at Welbeck Abbey in rambling (at 1s per head) through the pleasure grounds, gardens and riding school, the latter a fine building, but full of emptiness with the exception of several workmen, who evidently looked upon us as if we were *Feræ Naturæ* in charge of a keeper. A second halt was called at Edwinstone, a pretty Saxon village on the confines of Sherwood Forest, for the purpose of allowing any of the party bent on objects of historic interest to visit the 'Major Oak,' a tree of remarkable dimensions, and within the hollow trunk of which a dozen people can squeeze themselves; but we observed that 95 per cent of the company showed a decided preference for a more modern example called the 'Royal Oak,' with more inside accommodation!"

PERSONAL AND SOCIAL

News of Men and Women of the Industry

The Midlands Electricity Board announces that **Mr. L. G. Turner** has been appointed purchasing officer. He succeeds Mr. G. S. Buckingham, B.Sc., M.I.E.E., who was recently appointed chief engineer.

Mr. Turner, who was formerly the Board's assistant purchasing officer, was born at Stechford and attended Birmingham Central Technical College. He joined the City of Birmingham Electric Supply Department in 1924 and later became assistant purchasing officer. He moved to M.E.B. headquarters in 1949, soon after the reorganisation of the industry.

As briefly reported in last week's issue, **Mr. H. Vernon** has been elected chairman of the Association of Electrical Machinery Trades for the ensuing year. Mr. Vernon has spent all his business career with the Thos. W. Ward, Ltd., group of companies which he joined in 1913. He was appointed a local director of the parent company in 1936 and a full director in 1938. He has travelled widely both for his own group and on behalf of Government Departments. During the last war he served on three Advisory Panels for the Government mainly connected with electrical equipment, machine tools and compressed air machinery. In the past few years he has turned his attention to atomic energy and has been actively engaged on substantial contracts in this field.

Mr. H. Vernon

Morganite Resistors, Ltd., has appointed **Mr. M. G. B. Mason** as general sales manager and **Mr. W. W. Marshall,** B.Sc., Ph.D., as manager of its Technical Department.

Mr. V. H. F. Hopkins, M.I.Mech.E., has been appointed manager of engineering with the English Electric Co., Ltd., with headquarters at Brownsover Hall, Rugby. Mr. Hopkins will be responsible for all technical departments concerned with the design, development, production and operation of the company's diesel engines.

Mr. A. C. D. Burbidge, until recently senior representative in the Southern Electricity Board area for Burco, Ltd., has been appointed assistant sales manager on headquarters staff. **Mr. V. G. Dilnott,** assistant sales representative in the South Western Electricity Board area, succeeds Mr. Burbidge in the Southern Area.

General Jorge Sarmiento, head of the Atomic Energy Board of Peru, is paying a three weeks' visit to this country under British Council auspices. His programme, which has been arranged in consultation with the Atomic Energy Authority, the Board of Trade and the Nuclear Energy Trade Association Conference, will include visits to Calder Hall, Harwell, and university laboratories at London, Cambridge, Oxford and Liverpool. He will also make a number of industrial visits connected with atomic energy developments.

Mr. H. S. Wheeler has been appointed engineering assistant works manager at the Gravesend Works of W. T. Henley's Telegraph Works Co., Ltd., as from 1st July. Mr. Wheeler, who commenced at Henley's as a draughtsman in 1921, was appointed section leader in 1935 and chief draughtsman in 1951.

Mr. Victor Dale, the former director and secretary of the British Electrical Development Association, tells us that his address is now 11, Chesil Court, Chelsea Manor Street, London, S.W.3.

Mr. M. Evans, of Walsall, has been awarded the £100 prize given annually by members of the Federation of British Industries Industrial Art Committee to enable a final-year student of the Royal College of Art to travel abroad before beginning an industrial career. He has been studying at the College in the Department of Industrial Design (Engineering) and intends to visit Italy, France and Germany on the F.B.I. award. Mr. Evans has already travelled in Scandinavia and Italy as the winner of a Royal Society of Arts bursary for electric light fittings.

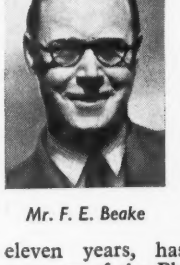
The State Electricity Commission of Victoria has appointed **Mr. N. T. Jewell,** M.E.E., A.M.I.E.(Aust.), to the newly created post of director of engineering. In his new position Mr. Jewell will be responsible to the Commission's chairman for the co-ordination of all the engineering activities of the undertaking. Mr. Jewell joined the Commission as an assistant engineer over thirty-five years ago. He held various engineering and administrative posts, including that of chief distribution engineer, before his last appointment as engineer for design and construction.

Mr. N. T. Jewell

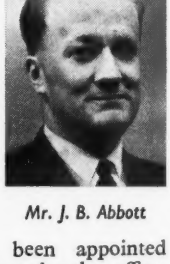
Mr. A. R. Shepley

Mr. A. R. Shepley, B.Sc., B.E. (Civ.), F.S.A.S.M., M.I.E. (Aust.), M.A.I.M.M., has been appointed by the Commission to succeed Mr. Jewell as engineer for design and construction. Mr. Shepley has been assistant general superintendent at Yallourn. He joined the Commission in 1951 as general superintendent at Morwell, near Yallourn, where a new brown coal open cut, new briquetting factories and a major power station are being established. Mr. Shepley joined the Commission after six years as chief civil engineer with the Hydro-Electric Commission of Tasmania.

Mr. F. E. Beake, A.M.I.E.E., a sales engineer at the Manchester office of Brook Motors, Ltd., for the past eleven years, has been appointed manager of the Plymouth sales office. He is a former Brook apprentice and has been with the company since 1930. Mr. Beake is succeeded at Manchester by **Mr. J. B. Abbott,** Graduate I.E.E., who started with Brook Motors as trainee sales engineer in 1950 and was appointed sales engineer at the Aberdeen branch in 1951. He completed his technical education at Huddersfield Technical College and subsequently at Robert Gordon's Technical College, Aberdeen. Mr. Abbott has been hon. secretary and chairman of the North of Scotland Graduate and Student Section of the I.E.E. and is at present vice-president of the Electrical Society of Aberdeen.



Mr. F. E. Beake



Mr. J. B. Abbott

The 23rd annual sports day and gala of **Johnson & Phillips, Ltd.,** was held at the company's sports ground at Kidbrooke, London, on 22nd June.

Mrs. A. C. Hartley presenting the J. & P. departmental athletic shield to Mr. F. Bayne (Switchgear Department)

Entries and attendance were excellent, and the inclusion of many well-known athletic clubs added to the success and excitement of the day's sport. The inter-departmental shield was won for the sixth year in succession by the Switchgear Department, this time by the overwhelming margin of 46 points. "Switchgear" talent was also in the forefront during the beauty competition, which was won by Mrs. Patricia Jeal of the drawing office. The prizes were presented by Mrs. Hartley, wife of Mr. A. Clifford Hartley, C.B.E., a director of J. & P.

Mr. and the Hon. Mrs. Leslie Gamage were at home at Fox Hill, Earley, nr. Reading, to over sixty graduate members of the **G.E.C. Overseas Club** on the occasion of their annual reunion on 21st June. Members undergoing training at various G.E.C. establishments in this country came from twenty overseas territories to spend a pleasant evening in the house and grounds of Fox Hill following a buffet supper on the lawn. There were representatives of Australia, Argentina, Brazil, Chile, Colombia, East Africa, Hong Kong, India, Iraq, Jordan, Kenya, Lebanon, Malaya, New Zealand, Nigeria, Pakistan, South Africa, Sudan, and Tasmania.

Mr. and Mrs. Gamage were assisted in entertaining by their nephew and niece, Mr. and Mrs. Timothy Ellis. Mrs. Ellis is a granddaughter of the late Lord Hirst.

More than 400 athletes took part in the recent sports and family day organised by the Sports Association of **F. Perkins, Ltd.** The guests included the Mayor and Mayoress of Peterborough. Mr. Frank Perkins, chairman and managing director of the company, Sir Richard Yeabsley (deputy chairman) and Mr. M. I. Prichard (deputy managing director) were also present. The Victor Ludorum trophy for the employee obtaining the most points was won by Mr. Ian Mitchell.

Mr. C. A. Hughes, A.M.I.E.E., a director of Siemens Electric Lamps & Supplies, Ltd., and Siemens Brothers & Co., Ltd., retired on 31st May after forty-six years with the Siemens organisation. Altogether he has spent fifty years in the electrical industry, having been with Falk, Stadelmann & Co. for four years before entering the service of Siemens Brothers Dynamo Works in 1911 where he was first employed as a technical assistant, dealing mainly in matters concerning tantalum lamps. He served in the Royal Engineers from 1914-18 and on returning to civil life was given the job of developing Siemens' Lighting Department. In 1924 he went to the United States with the first International Lighting Commission to study American developments in lighting. In that year he was appointed manager of the Lamp Department of Siemens Electric Lamps & Supplies and in 1940 became sales manager. Later he became a director of Siemens Electric Lamps & Supplies, Ltd., and also of Siemens Brothers & Co., Ltd. In the course of his career he had twice been chairman of the Council of E.L.M.A. and for two years president of E.L.F.A. On his retirement a large gathering assembled at Siemens' city offices when he was presented with an electrically operated lawn mower and an Oxford Dictionary. Mrs. Hughes was presented with a bouquet. In making the presentation, Dr. J. N. Aldington, managing director, referred to the outstanding service which Mr. Hughes had rendered to Siemens and to the electric lamp industry.

Mr. C. A. Hughes

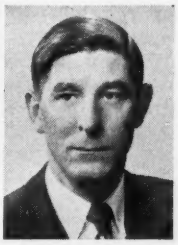
The Ministry of Power has reappointed **Mr. H. G. Partridge,** M.A., of Cardigan, as a part-time member of the South Wales Electricity Board.

Mr. N. B. Brooks, a director of Richard Johnson & Nephew, Ltd., has been appointed vice-chairman of the company.

Mr. B. E. Wheadon, M.B.E., chief technical representative with Desoutter Brothers, Ltd., has been appointed technical sales manager.

Mr. H. A. Luss has been appointed chairman of the Nuclear Group of the Scientific Instrument Makers' Association. Mr. Luss, who is at present joint managing director of Isotope Developments, Ltd., has also been appointed deputy chairman of the company.

Mr. Arthur J. Warner, of Harlow, Essex, has been appointed director of research by the Mycalex Corporation of America and associated companies. He will assume responsibility for materials and product development in an expanded programme to be initiated by the Corporation in electronic components as well as glass-bonded mica and ceramoplastic insulation and synthetic mica.



Mr. A. J. Warner

Mr. Warner graduated in chemistry at London University. He joined Standard Telephones & Cables, Ltd., as a raw materials control chemist in 1930 and later became a research chemist on styrene for the same company. In 1941 he was transferred to the Federal Telephone & Radio Corporation in the United States to assist in the defence programme and from 1941 to 1945 worked on research and development in high-frequency cables and associated equipment.

In 1945 he transferred to the Federal Telecommunications Laboratories, in charge of materials research and development, and in 1949 was appointed director of the chemical and physical laboratories, a post he held until 1953, when he returned to England as chief engineer of the Rectifier Division of Standard Telephones & Cables.

Members of the G.E.C. Overseas Club at Fox Hill, Earley

We reproduce a portrait of **Sir Alexander Sim** who, as reported in last week's *Electrical Review*, has joined the board of W. T. Henley's Telegraph Works Co., Ltd.

Sir Alexander Sim

In the Power Convention golf competitions held at the Royal Eastbourne Golf Course the winner of the G. P. Dennis Trophy was **Mr. A. W. Ferguson** (Northern Ireland). **Mr. F. Farthing** (G.E.C.) won the runner-up tankard. The Lady Citrine Rosebowl went to **Mrs. A. H. Young,** the runners-up being **Mrs. C. H. Russell** and **Mrs. W. E. Hind.**

The thirteenth annual sports meeting of the **Telegraph Construction & Maintenance Co., Ltd.,** and **Submarine Cables, Ltd.,** was held at the Telcon sports ground, Kidbrooke, on 29th June when competitors from head office (Mercury House) and the factories at Greenwich, Erith, Crawley and Farnborough engaged in a programme of over forty events. The "Sir Geoffrey Clarke" departmental challenge cup was won by the metals division, Crawley. The prizes were presented by Lady Dean and among those present were the Mayor and Mayoress of Greenwich, the Town Clerk, Sir John Dean (chairman of Telcon), Lord Colgrain, Mr. J. Innes and Dr. E. W. Smith (directors), Mr. G. T. W. Whitehead (director of Johnson & Phillips, Ltd.), and their ladies.

At the June meeting of the **A.S.E.E. Golfing Society** held at the Cuddington Golf Club, a stableford competition was played for the trophy presented by Tanjon, Ltd. A triple tie resulted with Mr. F. J. Hallett, Mr. E. A. Langsdon and Mr. C. J. Penny having equal points. Judging on the score of the last nine holes, the trophy was eventually awarded to Mr. Penny, with the runner-up trophy going to Mr. Hallett. The next meeting will be held at the West Herts Golf Club on 16th July and particulars can be obtained from Mr. C. J. Penny, hon. secretary, Duke's Court, Duke Street, London, S.W.1.

OBITUARY

Mr. J. H. Weaver, a director of Edmundsons Construction Co., Ltd., died on 27th June in hospital at Harrogate after a short illness. Since 1949 Mr. Weaver had looked after Edmundsons' contracting activities in the North of England. Before that he had spent a number of years as contracts manager with Electricity House, Ltd., a subsidiary of the Yorkshire Electric Power Company.

Mr. Bernard Hopps.—The death has occurred, at the age of seventy-seven, of Mr. Bernard Hopps, chairman and technical adviser of Lodge Plugs, Ltd.

WILLS

Mr. E. Sayers, formerly manager of the Aero Equipment Sales Department of the British Thomson-Houston Co., Ltd., who died on 20th September, 1955, left £13,067 gross (£12,465 net).

Mr. W. Meacher, M.I.E.E., a founder of the Westminster Engineering Co., Ltd., who died on 2nd February last, left £20,139 gross (£19,664 net).

Mr. G. D. Clegg, A.M.I.E.E., formerly power station superintendent at Nechells "A" and "B" stations, Midlands Division, C.E.A., who died on 27th October last, left £8,165 gross (£8,090 net).

Mr. T. Wadsworth, M.Sc., M.I.E.E., formerly for many years chief assistant to the head of the British Thomson-Houston Co.'s research laboratory at Rugby, who died on 13th October last, left £8,230 gross (£8,168 net).

Mr. L. E. Mold, O.B.E., M.I.E.E., of 36, Graham Park Road, Gosforth, Northumberland, former director of A. Reyrolle & Co., Ltd., and of C. A. Parsons & Co., Ltd., who died on 10th January last, left £13,210 gross (£11,681 net).

I.E.E. Premiums

THE Council of the Institution of Electrical Engineers has made the following award of premiums for papers read or accepted for publication during the 1956-57 session; the author's home or business address is shown after his name:—

GROUP A

Institution Premium (value £50): T. Ingledow, D.Sc. (Vancouver B.C.), R. M. Fairfield, B.Sc.(Eng.) (London, W.C.2), E. L. Davey, B.Sc.(Eng.) (Manchester), K. S. Brazier, B.Sc.(Eng.) (Manchester) and J. N. Gibson (Manchester).

Kelvin Premium (value £25): H. B. Law, B.Sc.Tech. (London, N.W.2).

John Hopkinson Premium (value £25): E. T. Norris (Cambridge).

GROUP B

Measurement and Control Section Premiums. — *Silvanus Thompson Premium* (value £20): M. E. Haine, M.Sc. (Aldermaston) and M. W. Jervis, M.Sc.Tech. (Knutsford). *Mather Premium* (value £15): L. Hartshorn, D.Sc. (Teddington) and J. J. Denton, B.Sc. (Teddington). Premiums value £5: P. R. Howard, Ph.D., B.Sc.(Eng.) (Oxshott); G. E. P. Box, B.E.M., B.Sc., Ph.D. (Manchester) and G. A. Coutie, M.A. (Manchester); and E. C. Greanias, M.S., C. J. Hoppel, B.S., M. Kloomok, M.S., and J. S. Osborne, B.S. (all of Endicott, N.Y.).

Radio and Telecommunication Section Premiums.—*Duddell Premium* (value £20): G. L. Grisdale, Ph.D. (Chelmsford), J. G. Morris, B.Sc. (Cheltenham) and D. S. Palmer, M.A. (Chelmsford). *Ambrose Fleming Premium* (value £15): Prof. H. E. M. Barlow, Ph.D., B.Sc.(Eng.) (Banstead). Premiums value £5: B. G. Pressey, M.Sc.(Eng.), Ph.D. (Slough), G. E. Ashwell, B.Sc. (Slough) and C. S. Fowler (Slough); E. W. Hayes (Petts Wood) and H. Page, M.Sc. (Tadworth); R. T. B. Wynn, C.B.E., M.A. (London, W.1) and F. A. Peachey (Hendon, N.W.4); A. G. Milnes, D.Sc. (Pittsburg, Pa., U.S.A.); T. Somerville, B.Sc. (Tadworth) and C. L. S. Gilford, M.Sc. (Wallington); J. B. Goodenough, Ph.D. (Lexington, Mass., U.S.A.); T. B. A. Senior, M.Sc., Ph.D. (Gt. Malvern); E. D. Daniel, M.A. (Washington, D.C., U.S.A.), P. E. Axon, O.B.E., M.Sc., Ph.D. (London, S.W.17) and W. T. Frost (Reigate); J. Brown, M.A., Ph.D. (London, W.C.1) and J. O. Spector, Ph.D. (Haifa, Israel); and W. F. Glover, B.Eng. (Bexley) and S. E. Buckley, B.Sc. (London, S.E.9).

Supply Section Premiums.—*John Snell Premium* (value £15): H. Goldenberg, M.Sc. (Leatherhead). Premium value £5: A. Morris Thomas, B.Sc. (Fulham, S.W.6) and D. F. Oakeshott, B.Sc. (Kingston-on-Thames).

Utilisation Section Premiums.—*Crompton Premium* (value £20): Prof. F. C. Williams, O.B.E., D.Sc., D.Phil., F.R.S. (Manchester), E. R. Laithwaite, M.Sc. (Manchester), L. S. Piggott, M.Sc. (Manchester) and P. J. Lawrenson, B.Sc. (Manchester). *Swan Premium* (value £15): T. E. Calverley, B.Sc.(Eng.) (Stafford) and D. G. Taylor, B.Sc. (Eng.) (Stafford). Premiums value £5: L. R. Blake, Ph.D., B.Sc. (Rugby); and H. B. Calverley, B.Sc.(Eng.) (Leeds), E. A. K. Jarvis, B.Sc. (Bradford) and E. Williams, B.Sc.(Eng.) (Bradford).

Non-Section Premiums.—Premium value £5: Prof. E. G. Cullwick, O.B.E., M.A., D.Sc. (Dundee).

GROUP C

Fahie Premium (value £10): J. W. Allnatt, B.Sc.(Eng.) (Wembley), E. D. J. Jones (London, N.W.2) and H. B. Law, B.Sc.Tech. (London, N.W.2).

Heaviside Premium (value £10): D. G. Lampard, M.Sc., Ph.D. (Chippendale, N.S.W., Australia).

Webber Premium (value £10): D. C. Flack, B.Sc.(Eng.), Ph.D. (Bristol).

Oversea Premiums for Senior Members (value £10): W. K. Clothier, M.E. (Chippendale, N.S.W., Australia) and L. Medina, Dipl.Ing. (Chippendale, N.S.W., Australia); and J. M. Magowan (Salisbury, S. Rhodesia).

Graduate and Student Premiums.—*Henry Nimmo Premium* (value £10): J. G. Page, B.Sc. (Coventry). Premiums to the value of £10 each: A. E. D. Heylen, B.Sc.(Eng.) (Tottenham, N.15), R. E. James, B.Sc.(Eng) (Rugby) and R. S. Wignall, B.Sc. (Bradford). Premiums to the value of £5 each: J. A. Denham, B.Sc.(Eng.) (Newcastle-on-Tyne), J. C. Earls, B.Sc.(Eng.) (Aberdeen), C. F. Ferguson, B.Sc.(Eng.) (Stafford), R. D. Langman, B.Sc. (Eng.) (Stafford), J. W. S. Payne, B.Sc.(Eng.), (Rugby) and E. J. Stocks, B.Sc.(Eng.) (Ilford).

INDUSTRY AND THE HOUSE

By A. M. F. PALMER, A.M.I.E.E., M.Inst.F., M.P.

PARLIAMENT reassembled last week after a rather longer Whitsun recess than usual. The fact is that, apart from completing the weary march through the clauses of the Finance Bill—which doesn't concern the Lords anyhow—parliamentarians have had rather less to do than is usual recently. A paucity of new legislation is mainly responsible. The Shops Bill, which set out on its pilgrimage in the Lords, has now completely disappeared without discussion in the Commons, to the relief of Government supporters and the intense irritation of most of the Opposition. In retrospect, the major legislative activities of the session have been the Rents Bill (now an Act), which does not concern us at all in these columns, and the Electricity Bill (soon to be an Act, it is hoped), which concerns us a great deal.

Because of the obvious unpredictability of the Upper House the Government, in the matter of the Electricity Bill, has been pushed a little too close to the edge of the Parliamentary timetable for comfort. Bearing in mind the thorough examination which the Bill received in the Commons, most would have thought that their Lordships would have been content to make the technical drafting improvements necessary in any measure in its final stage, give it their blessing and leave the matter there. However, as I have recorded before, things didn't turn out that way. From both Government and Opposition benches came an astonishing display of originality—some might say eccentricity—with the embarrassing result for the Minister of Power that in one matter at least his measure has been saddled with a nearly impossible proposition.

It is ironical to reflect that much of this activity over " amenity " protection in relation to new power stations and transmission lines has only come about because of a commendable desire on the part of those responsible to speed up electrical programmes and remove the reproach that our completion times are much behind those, say, of the Americans. But alas for good intentions ! If anything, as things stand now, matters are likely to proceed at a slower pace than before. I predict that when the Bill returns to the Commons, for them to concur or otherwise in the Lords' amendments, an effort will have been made to repair a situation which would allow anyone with a grievance against an electricity scheme to demand a public inquiry with an endless prospect of objections, delays and frustrations. Surely if the local planning authorities, responsible to elected bodies, are satisfied that is sufficient ?

Finance Bill

When the Commons on Thursday last resumed discussions on the Finance Bill, Mr. Roy Jenkins, one of Labour's younger financial experts, from the front bench moved an amendment to restrict the concession granted to overseas trade corporations to income tax and not to extend it, as the Bill proposes to do, to profits tax. In justification of his amendment Mr. Jenkins said that an expensive concession of this sort did nothing to lessen the amount of revenue the Chancellor of the Exchequer needed to raise. All the concession meant was that some other people—or some other companies—would now have to pay more tax than would otherwise be the case. Whatever the case for granting overseas trade corporations an exemption from United Kingdom income tax there was, in his view, no case at all for giving them the additional favour of exemption from profits tax. That was not only the view of the Opposition, but had been the conclusion also of the Radcliffe Commission.

Mr. Leslie Hale, Labour member for Oldham West—who has a Parliamentary reputation as an easy debater—quoted as an example of an undesirable effect of the proposal, a property company operating in Sao Paulo, Brazil, the value of whose investments, he said, had now been vastly enhanced by the news that its operations were likely to be exempted from United Kingdom income tax, with a benefit to speculators, but none at all to the British public. In answer to Mr. Hale, Sir Patrick Spens, who is a lawyer with considerable knowledge of industrial affairs, doubted if the company mentioned would be regarded by the Inland Revenue as an overseas trading concern and therefore the assumption on which the Opposition point was founded would not apply.

Answering the debate, the Chancellor of the Exchequer thought it a grave decision for the Opposition to come down against the concession. The Government was seeking to put British companies trading overseas in a better position to compete and for this reason had come to the conclusion that the right thing was to remove the present discrimination. He was not impressed by the argument that some shareholders might benefit unduly; it was excellent if British companies could be made more attractive to investors. The Government succeeded in carrying their view on a division by a majority of 49.

An interesting back bench Conservative amendment was proposed by Mr. Braine to provide that no company should be obliged to be regarded as an overseas trade corporation unless it wished. Mr. Braine's view apparently was that of : " Heads I win, tails you lose." The Government's clause, he said, might be a disadvantage to companies trading in those countries where taxation was higher than in the United Kingdom. This was a novel thought: for a very long time now it has been taken for granted that the poor Britons are the most highly taxed people anywhere under the sun. However, Mr. Powell, the Financial Secretary to the Treasury, was not unsympathetic to Mr. Braine's intention. He said that the Chancellor of the Exchequer accepted the purpose behind the present amendment but thought it necessary to draw up a new amendment to strike a mean between two extremes. This, he hoped, would be done for the Report stage.

Although from time to time in the past I have found it necessary to criticise Mr. Nabarro's anti-electrical activities, I must acknowledge the special place he is carving out for himself as a private legislator. After clean air, he has in recent months turned his attention to thermal insulation; on Friday his Bill which makes it compulsory for new industrial buildings to provide proper means of heat retention was considered on Report. Here he moved a new clause himself, empowering the Minister to make regulations to restrict the use of certain materials for heat insulating purposes. Mr. Nabarro said that this had been done after strong representations had been received pointing out that some materials, if employed, might add greatly to fire risk. The matter was of topical interest

because of the disastrous fire at the Jaguar car factory a few months ago. Mr. Renton, on behalf of the Ministry of Power, said that the Government advised acceptance of the new clause and undertook that, if this were done, the appropriate regulations would be laid before Parliament. After several other sensible amendments had been carried, the Report stage was concluded and the Bill given a third reading by the House.

Since, as I said at the beginning, Parliament has only just resumed, there is little more of interest for me to mention. For the next two or three Mondays, the Ministry of Power will be well up the list for Parliamentary questions and Mr. Maudling is likely to have a fairly busy time. Questions are already down challenging the latest increase in coal prices and curiosity is being shown also about alleged modifications in the nuclear power programme. In addition, Mr. Ridsdale wants to know how much money the electrical industry has received from public funds since 1951? Since it is usually taken that the electricity supply industry has proved the most profitable of the nationalised industries, it may be worth waiting to find out what Mr. Ridsdale is getting at.

PARLIAMENTARY REPORT

Grants to Farmers

The Agriculture Bill, which makes provision for Government grants to cover one-third of the cost of improvements to farms, has passed through the Commons and is now before the Lords. So far, although the Government have been urged to broaden the terms of the Bill to include the cost of providing electricity in farm-workers' cottages as qualifying for a grant, they have not given way. The second schedule lists as one of the improvements eligible for grants, "the provision or laying on of electric light or power to farms for agricultural purposes." When the Bill was given its second reading in the House of Lords last week speakers again stressed the need to provide assistance that would improve the amenities of farm workers. It is likely that some amendments on this subject will be put down.

Financing Scottish Rural Supplies

Sir D. Robertson asked the Secretary of State for Scotland how much of the net capital cost of £768,000 incurred in 1956 by the North of Scotland Hydro-Electric Board in making new connections in rural areas was charged against revenue for interest and how much for amortisation.

Mr. Maclay replied that the capital cost to the Board of new rural connections was about £950,000 in 1956. The whole of that sum was met by borrowing and would be amortised. The charge to the revenue in respect of interest charges was £25,000 in 1956.

Trade with Russia

Mr. Ormsby-Gore told Mr. Zilliacus that the Soviet authorities had not yet followed up the purchasing programme which they announced last year. The Prime Minister had invited them to do so.

Exchange of Nuclear Information

When questioned about the June, 1956, amendments to the agreement for the exchange of information on the peaceful use of atomic energy with the United States the Prime Minister, Mr. Macmillan, said that the agreement permitted, but did not oblige, the parties to exchange detailed designs and applied technology of particular reactor types. Recently a mutually acceptable basis had been found for the transmission of such detailed information about the Calder Hall type of reactor. The Atomic Energy Authority would make available to the United States Atomic Energy Commission, and to their contractors—solely for the purpose of work for the Commission—details of the design of the Calder Hall reactors, including developments up to 1st January, 1957. Other United States firms which held "access permits" from the United States Atomic Energy Commission would be able to obtain a body of information which was adequate, in the view of the A.E.A., for the evaluation of the gas-cooled, graphite-moderated power reactor. It would, of course, be open to United States firms wishing to go further than this to negotiate licensing agreements with the industrial groups in this country which had developed designs for commercial nuclear power stations from the basic Calder Hall design.

International Geophysical Year

Professor Sydney Chapman, F.R.S., who is president of the international committee responsible for the planning of the International Geophysical Year, has described it as a period of concentrated effort to gain a fuller understanding of our planet, in its manifold physical aspects. Some sixty nations and at least fifteen major international scientific organisations are taking part in it. The observations will be specially directed to the fluid envelope of our globe—the atmosphere and oceans—and to the influences exerted on them by the sun. But the solid earth beneath, and the outer confines of the atmosphere, verging on interplanetary space, will also be explored.

The scale of effort is indicated by the fact that tens of thousands of scientists at 3,500 stations will be making observations in accordance with a carefully pre-arranged plan. Each country is responsible for carrying out its programme in each of the fourteen subject divisions of the I.G.Y. plan. The responsible authority in each country is its scientific academy or similar organisation.

In the United Kingdom it is the Royal Society, at whose conversazione held at Burlington House last Friday the following were shown:—A model illustrating the production of magnetic storms and auroræ. A cathode-ray direction finding equipment which is used in the "Sferic" system for the location of thunderstorms. It consists of two radio receivers each connected to a directional frame aerial. Of the two aerials, one is aligned in a north-south direction, the other being placed east and west. Each aerial thus receives the component in its plane of direction of the signal generated by a lightning flash. The two receivers are carefully balanced, both for amplification and phase, and the ratio of the two components of the original signal is thus preserved throughout the equipment. The output from the receivers is connected to the opposing plates of a cathode-ray tube, which acts as a compass, showing the direction of arrival of the atmospherics. The position of individual thunderstorms can be determined with considerable accuracy with this equipment up to distances of 1,500 miles, using a network of observing stations.

Rocket-borne equipment for ionisation studies in the upper atmosphere also shown was designed to measure the free electron concentration in the ionosphere and the variation of concentration with the altitude. Use is made of the fact that free electrons modify the dielectric constant of a medium, the free space dielectric constant being reduced by the presence of electrons. A portion of the rocket nose cone is insulated from the body and this is used as a R.F. probing electrode to monitor the dielectric constant in the surrounding space at a frequency of 5 Mc/s. From the result, transmitted by radio to the base station, the electron density may be calculated.

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Serving School Meals

THERE has recently been a certain easing of the restrictions under which education authorities laboured in the matter of school meals services. One of the first authorities to take advantage of this is the West Suffolk County Council Education Committee at its new Ixworth Modern Secondary School.

After an inspection by the heating and electrical engineer of the Council's Architect's Department (Mr. G. H. Pollentine, A.M.I.H.V.E.) of a number of catering establishments, it was decided to employ cooking equipment made by the General Electric Co., Ltd. A particular point was that this equipment was readily built up from units into multiple ranges, facilitating extensions.

The kitchen at Ixworth School is laid out to provide 450 meals a day; at present it is serving about 350 luncheons daily. All the cooking equipment is concentrated on a central island round which there are various preparation bays. There is a double-oven range and roasting oven. The two ovens of the range have each a capacity of 7 cu ft and a large hotplate area incorporating twelve hotplates.

Control is by three-heat rotary switches on recessed panels on both sides of the oven, each with its individual pilot light. By releasing one screw, the switch panel can be swung forward for inspection and maintenance.

The two-tier cabinet roasting oven has a capacity of 7 cu ft per tier and is suitable for roasting 140 lb to 180 lb of meat in one charge. The two 9 cu ft steaming ovens, which are each capable of holding approximately 150 lb of potatoes, are used in this school for cooking puddings. Steam is generated in their heater wells by four standard 3 kW embedded immersion heaters. The oven operates at atmospheric pressure and the condensate returns to the heater well.

There are four vegetable boilers, three 20 gal and one 30 gal. The boilers have one-piece stainless steel pans and hob rings and the outer cases are heavy gauge sheet steel. The heating elements are clamped to the underside of the pans. Chromium-plated counterbalanced lids are fitted to the boilers. All the kitchen electrical equipment is controlled by a special panel designed for the kitchen by the G.E.C.

Outside the island, which is surrounded by a 9in white glazed stoneware channel, are the hot cupboards for keeping food hot and for warming plates, and they can be used to keep individual meals ready for service. The food is served direct from the hot cupboards to two service counters and passed through a hatchway to the assembly hall, where the children collect their meals.

An important part of the school curriculum is devoted to providing girls with a good knowledge of housecraft. As in all modern secondary schools a housecraft unit is provided representing a small flat with dining room, bedrooms and bathroom, where the children learn the work of running a home. A number of kitchen bays are provided in the housecraft room and three of them have G.E.C. electric cookers. Calor gas and solid fuel stoves are also provided so that the children can compare the various forms of fuel.

The school was designed in the West Suffolk County Architect's Department; the county architect is Mr. John Creese, O.B.E., A.R.I.B.A., and the architect in charge, Mr. P. R. Coulten, A.R.I.B.A. The electrical installation was designed by Mr. R. E. Spall, A.M.I.H.V.E., and his successor, Mr. G. H. Pollentine, A.M.I.H.V.E., was responsible for the selection and installation of the kitchen equipment. The electrical installation and wiring of the school were carried out by E. H. Ruddock, Ltd., Brightlingsea. The headmaster of the school is Mr. G. H. Peake, B.Sc., who has spent thirty years teaching in West Suffolk, having formerly held posts in Sudbury, Bury St. Edmunds and Stanton.

Above: General view of the kitchen and (right) showing how G.E.C. equipment can be built up on the unit principle

Telephone Progress

THE report for 1956-57 of the Telecommunication Engineering and Manufacturing Association says that there has been a continuation of the rapid growth of telephones throughout the world and during the period the total reached 101 million. The relative world position of the United Kingdom in this respect has, however, not improved. Exports of telephonic and telegraphic equipment from this country showed an increase of 22 per cent.

Reviewing the accounts of the Post Office for 1955-56, the report says that the tendency was quite good. The number of applicants for telephone connections during the year was 474,000 (against 471,000 in 1954-55) and the number of applicants outstanding at the end of the year was 344,000 (372,000). At the time the report went to press the figure had been further reduced to 258,500, reflecting some reduction in demand, perhaps only temporary, due to increased tariffs. The estimates for the current year provide for an increase of 3 per cent in expenditure upon the engineering works programme of the Post Office; the actual figure is £69·2 million.

Reference is made in the report to the transatlantic telephone cable, the prospect of electronic telephone exchanges, the spectacular growth of the telex service, trunk developments and education and training. The Association's activities during the year are summarised in an appendix.

INDUSTRIAL NEWS

Generating Sets for Delhi

The rapid industrial and commercial development of Delhi has resulted in a serious shortage of electrical power in the city. Although hydro-electric power is being developed, the Delhi State Electricity Board recently ordered diesel generating sets with a total capacity of more than 20,000 kW to meet the immediate power shortage. The new equipment will increase the city's power supply by about 20 per cent and will permit the lifting of power restrictions that have been imposed on certain new buildings.

The order (valued at £675,000) has been placed with two companies of the Brush Group, Mirrlees, Bickerton & Day, Ltd., and the Brush Electrical Engineering Co., Ltd.

It consists of Mirrlees type KVSS12 12-cylinder vee form pressure charged engines each having a site rating of 2,972 b.h.p. at 428 r.p.m. coupled to Brush 2,140 kW, 11,000 V, 3-phase, 50 c/s alternators and Mirrlees type KSS6 6-cylinder pressure charged engines each having a site rating of 1,440 b.h.p. at 428 r.p.m. coupled to 1,012 kW, 11,000 V, 3-phase alternators. The KSS6 sets will be erected at the central power station at Rajghat, Delhi, where there is a steam station, but the new diesel output will be coupled to the busbars of the main station. The KVSS12 sets will replace existing machines in the centre of the old city of Delhi. Finally, a new station of KSS6 and KVSS12 sets will be erected at Kilokri on the eastern side of the city.

The Brush Group is also supplying Mirrlees/Brush sets for the construction power house at the site of the Koyna hydro-electric project and a repeat order for further engines some of which are under installation at Rajkot. Others have been supplied for the Bhilai steel plant.

British Transport 1956

A brochure bearing this title published by the British Transport Commission (price 1s) contains illustrated notes on the Commission's report and accounts for the past year. It shows that the deficit on the railways was £57·5 million while there was a surplus of £3·1 million on other activities.

The Commission says that completion before 1970 of most of the electrification schemes included in the original Modernisation Plan is now regarded as feasible. There should be capacity to electrify further lines during the later 1960s, and the Commission is now considering what further projects British Railways should undertake.

By the end of the year the Commission had worked out a preliminary programme for the completion of all the main-line and suburban electrification schemes envisaged in the Modernisation Plan. This programme allows for the time required to test in service the completely new forms of equipment and rolling stock which the 25 kV a.c. system involves. Progress was made with the planning of the first stage of the electrification of the main line from Euston to Manchester and Liverpool—on the pilot section between Manchester and Crewe. The test section should be ready during 1958. Preliminary work was also begun on the 25 kV main-line electrification in East Anglia, and on the electrification at 660 V d.c. of the Southern Region lines to the Kent coast.

In the London Transport system, detailed planning is proceeding on the completion of the scheme for installing four tracks on the Metropolitan Line between Harrow and Rickmansworth and for extending electrification from Rickmansworth to Amersham and Chesham. Work should start in 1958 and be completed in 1961. Electrification of the outer section of the Central Line between Epping and Ongar will start this year.

Castle Donington Power Station

Messrs. Frank Hancock (1939), Ltd., Birmingham, inform us that they were the main electrical contractors for the lighting, power and control wiring at the Castle Donington power station described in our issue of 28th June.

Fire Damage

In 1956, for the first time since 1949, fire losses, at £27½ million, were lower than those of the previous year. This was reported by the chairman, Mr. E. C. T. Carden, at the annual general meeting of the Fire Offices Committee of the Fire Protection Association on 20th June. While welcoming this reversal of the tendency of losses to rise annually, he pointed out that the volume of damage remained disturbingly high. In the Association's technical work emphasis was now being laid on the study of industrial hazards and the analysis of fire reports was being carried out in greater detail to show those points requiring special attention. The committee, convened in 1955 to consider electricity in industry, had continued its work and approved recommendations for inclusion in the booklet "Electricity and the Fire Risk in Industrial and Commercial Premises."

Mining Examinations

The next mining legislation examinations for mechanical engineers' certificates, electrical engineers' certificates, mechanics' certificates Class I and electricians' certificates Class I will be held on 19th November, 1957, at Glasgow, Sunderland, Doncaster, Wigan, Cardiff and Stoke-on-Trent. Intending candidates should apply after 26th August for the necessary forms, stating whether they have previously attended an examination for any of the above certificates. Completed applications should be returned not later than 25th September to the secretary, Mining Qualifications Board, Ministry of Power, Thames House South, Millbank, London, S.W.1.

Marine Installations

A new publication has been issued by the International Electrotechnical Commission (1, rue de Varembe, Geneva; price 18 Swiss francs) entitled "Recommendations for Electrical Installations in Ships." In its 175 pages, the document contains 25 sections which, in addition to definitions cover the various technical aspects of the subject and include 35 tables. Two appendices deal with the classification of insulating materials and temperature measurements.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton £197 0s 0d
COPPER, H.C. Electro	ton £214 15s 0d
Fire Refined 99·70%	ton £213 0s 0d
Fire Refined 99·50%	ton £212 0s 0d
COPPER Tubes ..	lb 2s 1¼d
Sheet	ton —
H.C. wire and strip ..	ton £268 5s 0d
LEAD, English ..	ton £89 15s 0d
Foreign	ton £88 0s 0d
MERCURY	flask £90 0s 0d
TIN, block (English) ..	ton £764 0s 0d
ZINC, G.O.B. Foreign	ton £73 10s 0d
Electrolytic	ton —
BRASS Tubes (solid drawn)	lb 1s 8¾d
Sheet	ton —
Wire	lb 2s 6d
PHOSPHOR BRONZE Wire	lb 3s 10d
PLATINUM	oz £34 0s 0d
RUBBER, No. 1 R.S.S. spot	lb 26¾d—27d

Association of Electrical Machinery Trades

At the annual general meeting of the Association of Electrical Machinery Trades, held at the Kensington Palace Hotel, London, on 24th June, Mr. A. H. Spindler, the retiring chairman, submitted the report of the Council for the past year. He referred to the continued improvement in the standard of content of the Association journal, "Electrical Machinery," and drew attention to the importance of the work undertaken by Mr. R. A.

Joseph, Mr. T. Atkinson and their colleagues on the various Association Committees which dealt with the draft standards published by the British Standards Institution. Turning to educational matters, Mr. Spindler pointed out that the Council had now completed its side in the matter of electrical fitters' courses and it was up to members to ensure that their local technical colleges provided the necessary facilities for apprentices to study for the electrical fitters' courses and also for the special armature winders' courses which could be set up in the fourth year. As we briefly reported in our last issue Mr. H. Vernon (Thomas W. Ward, Ltd.) was elected chairman for the ensuing year and Mr. C. G. Aldridge (Hirst Electronic, Ltd.) was elected vice-chairman. Mr. E. W. Clark (C.S.S. Electrical Co., Ltd.) was re-elected hon. treasurer.

Suggestions Scheme Awards

Four employees of the South Western Electricity Board and three of the South Western Generating Division of the Central Electricity Authority have won awards totalling £390 for suggestions which helped to reduce running costs and to improve work methods. Since 1950 over 1,000 suggestions about better and easier ways of doing the job have been received from employees.

Neon Signs and Radio

London Borough Councils are being asked for their views on the conditions to be laid down when granting permission to erect neon signs to ensure that there is no interference with television and radio reception. This follows Paddington Borough Council's decision to impose the condition that "the installation shall be designed, installed and maintained in conformity with the British Standards Institution's Code of Practice C.P. 1006 : 1955—General Aspects of Radio Interference Suppression."

The imposition of this condition was challenged by a leading firm of sign manufacturers but, after discussion in committee, it was decided by Paddington Council to adhere to it. A similar condition was refused in an appeal against a decision of Hove Borough Council.

The report says it is felt by Paddington that interference with radio or television reception is an injury to amenity and it was decided to adhere to the condition and allow the Minister to adjudicate on the matter in the event of a formal appeal being made.

A report on this matter by Lambeth General Purposes Committee states: "The view has been expressed that consideration of amenity is confined to visual matters but it is submitted that this is taking a narrow view, particularly having in mind that consent under the Advertisement Regulations operates as planning consent to the use of land for the erection, etc., of advertisements. In this respect it is tantamount to development and a condition limiting interference with the enjoyment of neighbouring land is, it is submitted, reasonable."

Window Display Competition

A national window display competition is being organised by Hurseal, Ltd. It will be open to all Hurseal and "Hurdapta" stockists and will be held annually. The winner will receive a cash prize of £150 and a new Hurseal TV½ oil-filled electric panel radiator. Radiators of this type also accompany the second and third prizes of £75 and £50, respectively, and are offered as merit awards to the ten runners-up.

Entrants must have their windows on view from 15th October to 15th November. The displays are to be judged by a specially-appointed panel from postcard size photographs which must be submitted by the entrants to the company's London office by 22nd October.

A.D.A. Publications

The Aluminium Development Association, 33, Grosvenor Street, London, W.1, has issued a directory of members, an 18-page publication showing the names and addresses of the member companies together with corresponding details of their administrative and sales offices. The principal aluminium products of each company are indexed at the beginning of the publication.

The Association has also issued a list of films, film strips and wall charts. The 16 mm sound films now available on loan number nearly 50; these have been classified under the general subjects of production, working operations, joining, and applications. They include the film recently produced by the A.D.A. in conjunction with the manufacturers and users concerned of unpainted aluminium subway cars designed and constructed in Great Britain for service in Toronto, Canada. The book also gives details of 35 mm film strips available on loan.

Tungsram Distribution Arrangements

Hitherto Tungsram valves have been distributed to the home trade through Siemens Bros. & Co., Ltd., but owing to the changes in that organisation it is no longer possible to continue these arrangements. British Tungsram Radio Works, Ltd., announce that they are, therefore, undertaking the distribution through their own selling organisation. Mr. J. G. Reeves has joined the company as home sales manager from Siemens Bros. with whom he has handled the distribution of Tungsram valves for many years past. The following have been appointed to represent the company in various areas:—Mr. E. E. Scott: Essex, Suffolk, Norfolk, Cambridge, Huntingdon, North and East London postal districts. Mr. D. J. A. Berry: Kent, Surrey, Sussex, Hants, Dorset, S. Devon, Cornwall, South East and South West London postal districts. Mr. H. S. Stansall: Middlesex, Hertford, Beds, Bucks and Berks, Oxford, Wilts, Gloucester, Somerset, N. Devon, North West London postal district. Mr. H. Pearson: Lancashire, Cheshire, Furness, Westmorland, Cumberland. Mr. D. Emmett: Warwickshire, Worcestershire, Northampton, Leicester, Staffs, Salop, Lincs, Notts, Derbyshire. Mr. L. L. Greenhow: Yorkshire, Durham, Northumberland.

Atomic Power Insurance

A scheme for the insurance of industrial atomic installations in all parts of the world is outlined in a report issued last week by a special advisory committee of the British Insurance (Atomic Energy) Committee. The whole insurance market, it is considered, should collaborate to afford maximum protection in view of the very substantial values involved. It is recommended that all liability for radiation damage should lie with the reactor owners, who would be able to cover their liability by third-party insurance.

Power Convention Papers

Mr. J. W. Simpson, secretary of the British Electrical Power Convention, tells us that preprints of the papers presented at Eastbourne are available at cost price plus postage. The orders received for copies of the papers with discussion are not sufficient to warrant reprinting them separately but, as in previous years, they will be included in the proceedings of the Convention which it is hoped will be available in October.

Production Engineers' Conference

A conference on "Automatic Production—Change and Control" was held at Harrogate from 30th June to 3rd July under the auspices of the Institution of Production Engineers. Among the papers presented was one by Mr. D. L. Johnson, B.Sc.(Eng.), A.M.I.E.E., on "Product Design for Automated Production." In this the author, noting the tendency towards concentration of production in the hands of a few large concerns, said that it was in the national interest that the basic products of the few big units should be highly standardised and "automated" for low cost production. Smaller concerns would then make individual adaptations and composite assemblies of the basic products; undertake the manufacture of relatively simple series of components, using automated plant; carry out miscellaneous jobbing and sub-contract work; and engage in services, including specialised plant installation and maintenance. Mr. Johnson went on to show, with actual examples, how the principles of simplification, standardisation and specialisation were being put into practice.

Sir Walter Puckey dealt with "The

Challenge of the 'Dip.Tech.'" In his paper he examined in some detail the Diploma in Technology. He emphasised a number of requirements which had to be met by our technical education system, and the need for the closest co-operation and support of industry in the meeting of these requirements.

"Modern Railway Travel" Exhibition

The "Modern Railway Travel" Exhibition illustrating the progress of British Railways Modernisation Plan was officially opened by Mr. Harold Watkinson, M.P., Minister of Transport and Civil Aviation, at Battersea Wharf Goods Depot, London, last Friday and continued for the following three days. The exhibition comprised over thirty main exhibits including the first of the main-line diesel-electric locomotives to be delivered to British Railways under the Plan, one of the 350 h.p. type diesel-electric shunting locomotives, and the English Electric Co.'s "Deltic," a 3,300 h.p. express passenger or freight diesel-electric locomotive which by arrangement with the manufacturers is being tested on British Railways.

Batti-Wallahs' Society

The early days of the last war, when little was happening, were notable for the naval engagement with the *Graf Spee*, the German "pocket" battleship which had accounted for so many of our merchant vessels. At last week's luncheon of the Batti-Wallahs' Society Admiral Sir Charles Woodhouse, who commanded the *Ajax*, which took part in the engagement, gave a graphic account of the encounter. With typical naval modesty, he glossed over the heroism of the action, but nevertheless said sufficient to show that the Royal Navy can always be relied upon in time of need. Dr. L. G. Brazier (president) was in the chair and Mr. T. C. F. Bigland (the "Mate") read a letter from the Earl Mountbatten (an honorary member) regretting his inability to be present owing to another engagement. The next luncheon of the Society will be held on Wednesday, 31st July, when the guest speaker will be Sir Rex Hodges, managing director of the Merseyside Docks and Harbour Board.

Exide Service Convention

Mr. C. G. F. Pritchett, M.I.E.E., director of Chloride Batteries, Ltd., presided at the 28th Exide Service Convention held in Scarborough from 18th to 21st June. In his opening address he said that the very fact that to-day they were experiencing increased competition in itself meant that there were greater opportunities ahead. Mr. Pritchett claimed that Exide, with its resources in this country combined with its experience overseas, knew more about making batteries than anyone else.

There were three morning business sessions under the chairmanship of Mr. A. J. Gardner (of H. J. Galliers, Brighton) assisted by Mr. F. O. Coward (F. O. Coward, Ltd., Bristol). Papers were read by Mr. A. C. Stewart, sales manager, and senior members of his staff and by Mr. Pritchett on technical and other matters. Each address was followed by general discussions. The guest speaker was Mr. John Marsh, director of the Industrial Welfare Society, who spoke on "The Next Ten Years." The social programme included golf, a steamer trip, official luncheons and the annual Exide banquet, ball and cabaret.

Coal Prices Raised

In announcing graded increases in the price of coal on 1st July the National Coal Board said that the average rise in the price of power station coal would be 5s 1d a ton. The Central Electricity Authority says that the higher price will add £10½ million to its coal bill.

Identical Lamp Tenders

It was reported at last week's meeting of the Middlesex County Council that eight identical tenders, totalling £7,800 each, had been received for a year's supply of electric lamps, when the Council invited tenders from all ten manufacturers licensed by the British Standards Institution. The matter was referred to the Council's clerk for "such action as may appear appropriate under the Restrictive Trade Practices Act."

Material Handling Agreement

The Austin Motor Co., Ltd., and Crompton Parkinson, Ltd., announce an agreement with Clark Equipment International C.A. This company is an export subsidiary of the Clark Equipment Co., of Battle Creek, U.S.A., manufacturers of industrial material handling equipment with a world-wide reputation for the quality and variety of its products. Under the terms of the agreement the Clark Equipment Co. will join the Austin Motor Co., Ltd., and Crompton Parkinson, Ltd., in the ownership and development of the material handling business carried on by I.T.D., Ltd. In addition to sales and service, which is already the responsibility of the company, I.T.D., Ltd., will in future be concerned with the manufacture of fork-lift equipment produced at the recently extended Hall Green factory. The manufacture of Morrison Electricar road vehicles, together with sales and service administration, will be concentrated at the South Wigston Works.

Electronics in Automation

This was the subject of a Convention held at Cambridge from 27th June to 1st July by the British Institution of Radio Engineers. In his opening address the president (Mr. G. A. Marriott, B.A.(Cantab.)) said that although many engineers disliked the word "automation" it was one of those generic terms which were indicative rather than descriptive of a broad line of development and it was a necessary and useful addition to our vocabulary.

The object of the Convention was to review for the benefit of industry generally the ways in which the electronics industry could contribute to automation.

Moulding Machine Display

From 1st July and until the end of the British Plastics Exhibition at Olympia, Dowding & Doll, Ltd., will hold a display of both the Dowding automatic fast-cycling and the Westminster injection moulding machines in their showrooms at 346, Kensington High Street, London, W.14.

Goods by Rail

The British Transport Commission is distributing to traders a booklet explaining the Railway Merchandise Charges Scheme, which came into operation on 1st July. Emphasising that flexibility will be the keynote of future charging, the Commission says that it is its intention to develop to the full profitable lines of business.

Trade Announcements

Dewhurst & Partner, Ltd., have moved their Newcastle and Nottingham offices to more commodious premises. The new addresses are 46, Great North Road, Newcastle-on-Tyne, 2 (telephone: Newcastle 22340), and Bentinck Buildings, Wheeler Gate, Nottingham (telephone: Nottingham 40214). The area managers are: Newcastle, Mr. Ford; Nottingham, Mr. Owen.

Ascot Lamps & Lighting, Ltd., have made the following appointments to their sales staff:—Mr. P. Leven, assistant sales manager and representative for London, Essex, Suffolk and Norfolk; Mr. S. G. Aldous, representative for the Midlands, Lancashire, Northern Ireland, and Warwickshire; Mr. W. Morley, representative for the Northern Counties; Mr. P. C. Lock, representative for Hampshire, Berkshire, Oxfordshire and S. E. London; and Mr. S. Lang, representative for West London, Kent, Surrey and Sussex.

Henry Hargreaves & Sons, Ltd., of Bury, Lancs., have opened a London office at 603, Grand Buildings, Trafalgar Square, W.C.2 (telephone: Whitehall 4805). Mr. Cyril F. Morgan, L.R.I.B.A., A.M.I.Mech.E., who is in charge of this office, has joined the company as technical manager for the London area.

New offices at 38-40, Elm Grove, Portsmouth, have been opened by the **Norris Warming Co., Ltd.,** and **F. A. Norris & Co., Ltd.**

Pirelli, Ltd., has opened a sales office at 222, Bothwell Street, Glasgow, C.2 (telephone: Central 4994), under the management of Mr. J. M. Mallock.

Power Needs of the World

Discussions at the World Power Conference, Belgrade

SUMMARISING views expressed in papers on economic aspects presented for discussion at the recent sectional meeting at Belgrade of the World Power Conference, Mr. J. Stanovnik pointed out that the yearly consumption of energy per head in countries with developed industry averaged over three tons of coal equivalent (the U.S.A. and Canada leading with 8·18 and 7·55 tons), compared with less than one ton in underdeveloped countries. Nevertheless, a low ratio was a symptom rather than a cause. The former group owned about 50 per cent of the world's reserves of coal, 30 per cent of the oil and 25 per cent of the water power and consumed 70 per cent of the total energy used. The second group were the greatest exporters of fuel.

The provision of means of power production required high capital investment and its application required even more. Retarded development was chiefly due to a low rate of capital accumulation arising from historical causes and not from absence of natural resources or inertness of native populations. Experience gained in historical development of industrial countries could not be applied to the others with their immediate aim of a rise in living standards. This implied a greater consumption per head in the home and in the promotion of productivity, which necessitated the adaptation of the most modern techniques to social and natural conditions. For this purpose a far greater use of energy would be needed than had been applied at corresponding stages of earlier industrialisation.

The Western nations had been able to ignore agriculture because they could meet their needs through the export of manufactured goods, but the economically rising nations must simultaneously with industry develop their agriculture with irrigation and drainage and production of fertilisers, all big consumers of energy.

Production and Energy Consumption

Economic development was accompanied by a general rise of productivity of labour through its transfer to secondary and tertiary occupations and the substitution of mechanical power for manual effort. Broadly, every 1 per cent increase in industrial production was followed by 2·3 per cent in energy consumption. Two-thirds of the world's total consumption of energy was in manufacturing industries, though these employed only one-fifth of the working population. Consumption of energy varied with conditions of use. Thus Canada and Holland, each with about 30 per cent of people employed industrially, had energy consumptions per head of 13,840 and 4,025 lb of coal equivalent, which did not reflect the relative national incomes. Again electrolytic production of certain light metals called for especially large amounts of energy per ton, e.g. titanium 40,000 kWh and aluminium 18,000 kWh.

Every $1,000 of capital invested in manufacturing industries required an addition of at least $100 to provide power. At the present time solid fuel might have to bear transport charges in under-developed countries for 300 to 400 miles, which would double the cost of production, compared with 400 to 500 miles for the transmission of electricity. The difference between developed and underdeveloped countries in primary energy was increased still more by lower efficiency in use. In the U.S.A., for example, while primary energy input was 21 times that in India, the useful energy was 100 times greater.

Regarding nuclear power, the costs of which were greatly dependent on the size of reactors and a utilisation factor of 80 to 90 per cent, so high a utilisation factor was obtainable only where a large basic industrial consumption of energy existed and where the reactors were integrated in a network in which thermal or hydro power stations dealt with daily or seasonal peaks.

Summing up, energy production, technical knowledge and accumulation of capital were stated as the basic factors that determined the rate of economic development. Lack of national resources as an absolute prohibiting factor did not appear in any part of the world. Lack of financial means for constructing and developing these resources was the chief restrictive influence, the position being complicated by the necessity in most cases of importing equipment paid for from foreign exchange reserves. The International Bank had to work on commercial principles and energy projects were not business propositions. The suggestion was made for the setting up of a new non-commercial institution, within the United Nations, to aid financially the development of national power systems in less economically favoured countries.

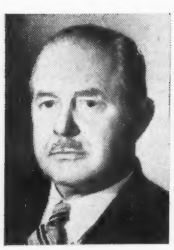
Among the 38 supporting papers reviewed was one by Mr. G. H. Daniel (Ministry of Fuel and Power) and Professor E. A. G. Robinson (Cambridge University), who showed that, broadly speaking, a country with ten times the national income of another had twenty-six times the fuel consumption, though the relation varied greatly according to the industrial structure (which ranged from mining and metal production to agriculture), climate and concentration of population. In England two tons of coal were burned to produce one ton of steel goods as against one-eighth of a ton to make a ton of bricks.

The right level of investment in the fuel and power industries could not be precisely calculated in advance by any universally applicable method. It was best arrived at separately for each country as a natural process in which individual consumers had the maximum freedom of choice between forms of energy. The fuel industries should have clear responsibilities for satisfying demands for their products, subject to a financial structure that ensured due regard to costs, and should prepare detailed investment plans based on their own assessments of future requirements and Government policies regarding general economic development.

Lack of Statistical Information

Mr. R. Y. Sanders (Central Electricity Authority) pointed out the shortcomings of statistics now available even in more fully developed countries. Data in many cases were expressed in money values, which fluctuated, rather than in quantities. The time-scale of progress in the past had been largely determined by the incidence of inventions. Moreover the accuracy of early data in undeveloped countries was often questionable and called for the establishment of adequate statistical services as soon as practicable.

International comparisons of gross and net energy



Mr. R. Y. Sanders

Mr. J. K. Hunter

Mr. A. W. Pedder

requirements were vitiated by quantitative measurements that were not related to quality. For instance, little was known about national average calorific values of fuel. The average in the U.S.A. for coal burned in power stations was 12·5 per cent higher than in Great Britain, where the figure varied from under 7,000 to 15,000 B.Th.U./lb. The effect of solar energy (other than the negligible amount deliberately harnessed) was ignored in international comparisons, yet even in the British temperate climate the amount received at the earth's surface exceeded the thermal content of all the power used, while differences in the demand for fuel in a severe winter might reach 10 million tons.

The conclusion was reached that correlation between consumption of energy and gross production was only of limited application to under-developed countries having regard to differences in the pattern of social development. It was necessary to examine the factors in the modern world that were likely to give rise, in the less developed countries, to a faster rate of progress in the future.

Water as the basis of all economic development was considered by Messrs. J. K. Hunter (Sir Alexander Gibb & Partners) and A. W. Pedder (Merz and McLellan) in relation to the integration of the five main services it provided. These were given as domestic (human and animal), agriculture, industry, navigation and power, to which priority would be assigned according to regional characteristics. Interests often conflicted and capital investment was usually heavy, so the overall planning of a complete scheme for a river basin was desirable. Several ways of allocating costs between the different services were discussed, on the basis that expenditure on any of the services under a multi-purpose scheme would be less than it would have been under a scheme designed to provide one service only. Costs incurred solely for one service would be charged to that service. Those shared in common could be dealt with in several ways, the most promising for securing general agreement being the "alternative single-purpose expenditure theory." In this the common costs would be divided in proportion to the hypothetical alternative expenditure which would be incurred if each participant were to construct the facility for a single function. As the installations and structures would have a life of 50 years or more agreements should be subject to periodic review to take account of changing economic circumstances.

Letters to the Editor

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

The Beginnings of A.C. Practice

IN his otherwise sound review (*Electrical Review*, 14th June) of the recently published book on "The j Operator for Electrical Engineers," the reviewer, "H.J.J.," gives, inaccurately, the year 1888 as the beginning of commercial alternating current practice. In fact, Sir Coutts Lindsay's first plant at the Grosvenor Gallery was put in in 1883 and the change to parallel connection of transformers was made under the guidance of S. Z. de Ferranti in 1886.

By 1887 the network of overhead lines at 2·4 kV from the Grosvenor Gallery comprised some 16 route miles.

Bromley, Kent. E. H. JESTY, A.M.I.E.E.

The Ring Circuit

WITHOUT wishing in the least to detract from the credit due to the Committee responsible for Post-War Building Study No. 11 in general, and to Mr. Forbes Jackson in particular, for the institution of the ring circuit and all-purpose socket outlet and plug, I should like to point out that advocacy of this method and change was common long before the Committee's findings were published.

For the record I may be allowed to refer to articles of my own, particularly one in the *Electrician* for 4th December, 1942, in which not only was the ring circuit described and advocated, but also one common size of socket outlet with fused plug and with flat pins. The only difference between what I described and what was eventually established was my suggestion for a 15 A socket, whereas the 13 A socket was adopted. This was a year before the presentation to the Institution by Messrs. Forbes Jackson and Wood of the paper, "The Future of the Domestic Wiring Installation," in which the ring circuit was first mentioned authoritatively.

However, I must admit that no action could ever have resulted from a lone voice of this kind, and but for the enlightened recommendations of the Committee and the energetic action taken by Mr. Forbes Jackson—I believe ring circuits were first practically installed in installations under his control—we should never have seen and enjoyed this advance in installation technique. I therefore have very great pleasure in adding my word of commendation to those already expressed in your columns.

Elham, Kent. T. C. GILBERT, M.I.E.E.

Thermo-Nuclear Reactors

A PRIVATE three-day conference on "Controlled Thermo-nuclear Reactions" was recently held at the Atomic Energy Research Establishment, Harwell. Delegates included research workers from the United States and about 100 representatives from British industrial firms, universities and interested Government Departments. The purpose of the conference was to discuss the progress of both the British and American programmes and to examine some of the practical problems in which it is hoped that British industry might assist. The conference was held on a "classified" basis (i.e. secret information was included) and the proceedings are not being published.

Welding Developments

Papers Presented at the British Commonwealth Conference

THE construction of large rotors for the two multi-stage gas turbines now in service in Nairobi power station was described by Mr. R. R. Roberts (British Thomson-Houston Co.) in a paper presented at the British Commonwealth Welding Conference, the earlier proceedings at which were dealt with in last week's issue. Mr. Roberts explained that resistance to creep at the high operating temperatures necessitated the use of austenitic steels. Such steels, he said, were not available in large enough forgings which necessitated the building-up of the rotors by welding together a number of small forgings. Welding also offered the advantage of enabling the cooler end to be made from less expensive steels. The nine-stage rotor, driving both a centrifugal compressor and an alternator, consisted of five sections of two types of steel: two shaft ends and three body sections welded together.

The manual metal-arc process was used, since the argon-arc with tungsten electrode (which had the advantage of absence of welding slag) was ruled out by inaccessibility for the torch. A major difficulty was the avoidance of cracking of fully austenitic deposits, which could also affect the parent metal. The procedure finally adopted was to assemble the partly machined forgings and complete the shaft-end welds without preheat. The first three runs of each body weld were also made before preheating. The rotor was rotated continuously in a gas-fired box until its temperature reached 650 deg C. One run was then deposited in each of the two blading grooves and the rotor cooled slowly to 150 deg C for slag removal and cleaning of the weld. The cycle was repeated for each run of weld metal (18 per cent Cr-10 per cent Ni-2 per cent Mo). On completion of welding the rotor was maintained at 650 deg C for 72 hours and then allowed to cool slowly to room temperature.

Application in Atomic Energy Field

The application of welding in the atomic energy field was the subject of a paper by Mr. L. Rotherham (Director of Research and Development, U.K. Atomic Energy Authority) and Mr. I. H. Hogg (welding adviser to the Authority).

The production of energy from nuclear fission was divided into two phases—the preparation of suitable fuel and the construction of reactors to " burn " the fuel and utilise the heat thus generated.

The fuel was prepared by refining crude uranium ore and casting highly purified metal into bars subsequently inserted into protective sheaths. After undergoing irradiation in the reactors, the uranium was further processed to extract the plutonium formed.

At opposite ends of the range of reactor possibilities were those operating with neutrons at thermal energies (e.g. Calder Hall) and those with neutrons at high velocities (e.g. the fast reactor at Dounreay).

In the gas-cooled graphite-moderated thermal reactor, the fuel was natural uranium or uranium only slightly enriched, the neutrons being slowed down to thermal velocities by being passed through a graphite moderator. The Windscale piles were of this type, but were designed purely for plutonium production.

The Windscale fuel elements were sheathed with aluminium, and those for Calder Hall with a magnesium alloy. The sealing of the containers was extremely important and was done by automatic argon-arc welding and subjected to stringent radiographic examination and leak testing.

The core of the reactor was built up of graphite blocks in roughly cylindrical form with vertical channels to contain the fuel elements. It was enclosed in a pressure vessel capable of withstanding a working pressure of 100 lb/sq in. The vessel was welded in sections on site and lifted over the concrete reactor building, in which the final circumferential welds were made.

The vessel was stress-relieved by means of stainless steel tubular heating elements assembled inside, the outside being lagged. The electrical load was 1½ MW and it took three days to reach the required temperature of 600 deg C.

The reactor core was supported on a welded grid, resting on brackets welded to the pressure shell, which had to support a weight of 1,400 tons without deflecting more than ¼in.

Welding of Heat Exchangers

The four heat exchangers were fabricated in sections at the contractor's works, each section being stress-relieved. The sections were subsequently welded together on site, each circumferential joint being stress-relieved by induction heating at 3,000 c/s with a power input of 200 kW. Electrical resistance welded tubing was used in the heat exchangers, and 10¼ million studs were resistance welded to these tubes to improve heat transfer.

Among other possible types of reactor was one having a graphite moderator, but liquid sodium instead of gas as a coolant. An important problem was the protection of the graphite from the sodium. For either of the solutions at present envisaged, a considerable quantity of metal would be introduced into the core in addition to the fuel-element cans. The choice of suitable material was extremely limited, and might be zirconium or one of its alloys. To preserve the ductility of this material, welding in inert atmospheres would be necessary.

In the light-water moderated and cooled reactor, both coolant and moderator were natural water. In the U.S.A. a station of at least 60 MW capacity was being built at Shippingport, and American submarine reactors were of this type.

To obtain the required temperatures without boiling, pressures of the order of 1,500 to 2,000 lb/sq in were required. The pressure vessel for the Shippingport reactor was 9ft in diameter and made of 8½in thick plate with ¼in thick stainless steel cladding.

Corrosion would present a serious problem. If zirconium, for instance, were used in the core the nitrogen content of the weld must be reduced to the absolute minimum, entailing extremely efficient shielding during welding, using a complete dry-box system.

If welding had not been available, it would have had to be invented before power from atomic energy could have been made available.

During the subsequent discussion, Mr. Hogg replying to a question by Mr. J. W. Atherton (Stewarts & Lloyds,

Australia), said that welding without a backing bar was the whole aim in developing the process. When dealing with the liquors that were used, he could not afford to have a backing bar where there was any entrapment of radioactive material.

Mr. M. E. Pool (Middlesbrough) quoted the remark in the paper that the welds " were subject to a form of 'knife-line' corrosion in the liquors involved." From the comment that heat treatment, had it been practicable, could have cured this, he assumed that the trouble was caused in oxy-acetylene welding through heating the material to a high temperature for a longer period than the fusion-welding process and not through carbon pick-up from the oxy-acetylene flame.

Mr. Hogg considered the reason to be rather the rate of cooling than a high temperature for a long time. It was not caused by carbon pick-up. Experiments with different flames showed that in a flash-put weld there was obvious corrosion. The concentrated heat at one point was quenched quickly when the source of heat was taken away. On the pressure weld, there was corrosion at two points, and on the flash-put weld there was " knife-line " attack. In other words, it was purely a function of the heat cycle in the weld and had nothing to do with the fact that oxy-acetylene was used.

Among the contributors to the discussion were Mr. H. Thomasson (Hamilton, Canada), Mr. J. A. McWilliam (Firth-Vickers Stainless Steels, Ltd.) and Mr. W. P. Campbell (Department of Mines, Canada).

Mr. E. V. Beatson (Joseph Lucas, Ltd.) expressed surprise that it was found possible to braze stainless steel. Mr. Hogg confirmed that the steel was 18/8 stainless. The answer lay in the extremely fine tolerances. He, too, had been surprised, because usually flux or an inert atmosphere was needed to do this kind of brazing. Admittedly, the method used went rather against conventional practice.

Mr. F. Hirschmann (London) pointed out that fully automatic equipment for the site welding of pipes was now available and was being built for the aircraft industry. All that was needed was an argon-arc torch, a means of moving it around, and a very sensitive control to replace the movement of the hand of the welder. The control now available moved the torch within fractions of a thousandth, so that either there could be constant penetration or the penetration could be automatically altered.

Mr. P. F. Wilks (Quasi-Arc, Ltd.) added that there had been recent developments in another fully austenitic stainless steel—the 25/20 class—which was also notorious for micro-fissuring. One could now get multi-layer deposits which had vastly improved mechanical properties accompanied by a big reduction in micro-fissuring.

Reactive Metals Welding

Under the heading of welding reactive metals, Dr. F. G. Cox (Murex) discussed the problems involved in dealing with zirconium, tantalum and niobium. In general, the argon arc was employed for thicker material, resistance welding being applicable to sheets thinner than, say, 0·02in. Zirconium, although a newcomer commercially, was attracting most attention because of its applications in nuclear engineering. Its excellent resistance to corrosion by high-temperature water and its low absorption cross-section to thermal neutrons were especially desirable qualities for small compact reactors. It was cheaper than tantalum, nearly as resistant to acid corrosion and superior as regards attack by alkalis. Niobium was also becoming of interest in the nuclear energy field by virtue of its high resistance to creep at elevated temperatures, coupled with good corrosion resistance (though less than that offered by tantalum) and acceptable nuclear properties.

All three metals reacted rapidly at temperatures well below their melting points with common gases, such as nitrogen, oxygen, hydrogen and carbon dioxide with deleterious effect on their ductility — for instance, zirconium with an oxygen content of only 0·2 per cent by weight would be too brittle for mechanical work. Furthermore, they reacted vigorously at their melting points with all known fluxes, ruling out most of the conventional welding techniques.

In argon-arc welding the heat was supplied by an arc struck from a non-consumable tungsten electrode and the molten metal was protected from atmospheric contamination (the main problem in welding these metals). In resistance welding the weld nugget was protected both from the electrode materials and from contamination by the metal itself. The choice of welding current for tantalum and niobium was governed by their high melting points (2,996 and 2,468 deg C) which approached that of the tungsten electrode; d.c. with the electrode negative was preferable in order to concentrate the heat in the sheet rather than on the electrode. For welding zirconium in sheets of 0·03in, d.c. ensured less contamination. Machine welding with its faster and more constant speeds and steadier arc length minimised risk of contamination.

Co-operative Welding Research

Dr. H. G. Taylor (director of E.R.A. and formerly director of the British Welding Research Association) gave a paper on co-operative welding research in Britain. Promptings for research, he said, rose from dissatisfaction, whether of the scientist whose thirst for knowledge was not gratified or from the engineer whose aim was always beyond his grasp. So long as welds could be distinguished in any of their properties from the parent metal to which they were joined, so long as there were materials which could not be welded, so long as there was a possibility of making a better weld at less cost, so long would there be need for welding research.

The introduction of the covered electrode early in the century was one milestone in welding progress and the tremendous spurt of activity in the last war another. A third was the symposium on the welding of iron and steel, organised by the Iron and Steel Institute in 1935, which owed its inception to Dr. H. J. Gough, who in a letter to the Metallurgy Research Board of the D.S.I.R. pointed out that the increasing use of welded construction and repair in many branches of industry appeared to be " proceeding in advance of that accurate knowledge on which a new form of engineering construction should be based."

That symposium demonstrated the great possibilities for future development, provided attention was given to elucidating the many problems arising from the industrial application of welding, including deficiencies in knowledge, and to the problems remaining for solution. The full intentions of the organisers, however, were not achieved until the British Welding Research Association was formed in 1946.

Dr. Taylor then outlined the research programme of the B.W.R.A. and the extent of its achievements, mentioning that researches on non-ferrous metals had for some years formed a large section of its activities. The future of co-operative welding research, he emphasised, depended very much on industry. There was much to be done. Some of it would be done by the suppliers of equipment and electrodes, but much could more profitably be done on a co-operative basis to the advan-

tage of the whole industry. He quoted as examples the increased reliability of both arc and resistance welds; improved and cheapened methods of inspection; a code of practice for the resistance welding of heat-resisting alloys; improved methods of welding very thick sections, such as might be used for pressure vessels for power plant and atomic energy; a final solution of the brittle fracture problem; and an attempt to reduce the dependence of weld quality on human skill and effort. A start might be made in the development of a range of standard electrodes, so that tests could represent a comparison of the true weldability of base metals, uninfluenced by unavoidable variability of electrodes made from commercial materials. Operational research was required for the more efficient use of any one welding method. He said that at present there was no established method for measuring the overall efficiency of the welding operation.

ELECTRONICS IN AUTOMATION

THE 1957 convention of the British Institute of Radio Engineers, which was held at Cambridge in the Cavendish Laboratory from 26th June to 1st July, had "Electronics in Automation" as its theme. The delegates included representatives from more than a dozen other countries.

The first session (chairman, Dr. A. D. Booth) dealt with design, development and use in both office and factory processes of computers and their components, the latter including the store, the arithmetic unit and the computing details. It was stated that only within very recent years had electronic computers been really applicable to non-scientific purposes. One feature of a computer for general business use described was the large amount of information stored in the "memory," for which a magnetic drum was employed. It was being supplied to a large industrial concern and produced pay-slips at the rate of one per second, at the same time calculating group bonus and accountancy summaries.

Digital computers had been designed to control factory processes with individual attention to each of the products. This gave great flexibility in coping with variations in raw materials and in making, at mass-production prices, a wide range of goods each matched to a customer's requirements. While the components differed considerably from those of business computers, the factory-control type used the same basic techniques and logical processes as other digital computers.

Another paper described the means by which reliable recognition of faulty typed or printed characters was obtainable at a rate of 200 to 300 per second. Particulars were also given of a machine which scanned printed matter, especially rows of figures required for accountancy, and "translated" them on to punched cards.

A second session (chairman, Mr. E. E. Webster) was concerned more specifically with electronically controlled machine tools, such as those that could make copies from an original component. The main object was to achieve maximum utilisation of machine time by carrying out automatically (instead of within the limits imposed by human operation) the reading of blueprints, setting of tools, movement of table motions and gauging of dimensions. A technique was described whereby dimensions normally given on blueprints were prepared on standard punched cards as used for business accounting. Each card contained the information for positioning eight hole centres and any number of cards could successively present the data to an electronically controlled machine table. The key measuring instrument, the "Inductosyn," which in its linear form was capable of a positional accuracy better than 0·0001 inches with a repeatability of 25 micro inches, replaced the precision scale read by a skilled operator. An "Inductosyn" master, prepared by precision optical methods, reproduced the "Inductosyn" elements by printing metallic conductors on glass plates which did not deteriorate in use.

Simulators (or analogue computers), which were regarded as one of the most important contributions towards securing automation, were discussed in ten papers at another session (chairman, Professor D. G. Tucker). An example cited was that of a machine having powered automatic controls, the effect of which, as regards vibration, had to be ascertained beforehand to avoid possible accidents or noise or inefficiency later. A further use was the determination by analogy of the input and output of automatic control systems, especially those in which the characteristics of a piece of equipment had to be determined without taking it out of service. Simulators aimed at reproducing situations when the actual plant equipment could not be used experimentally. Simulation methods of dealing with problems peculiar to nuclear reactors and heat exchangers were described.

Hinkley Point Site Approved

THE Minister of Power has given his consent to the construction by the Central Electricity Authority of a nuclear power station at Hinkley Point, Somerset. A public inquiry into the proposal was held at Bridgwater in May by inspectors from the Ministry of Power and the Ministry of Housing and Local Government.

The Minister appreciates that, as pointed out at the inquiry, the coast at Hinkley Point has a character at present isolated and undeveloped, but sites for nuclear power stations as suitable as that at Hinkley Point are very difficult to find and the Minister does not consider that a power station on this site will seriously affect the amenities in this sparsely populated area or be unduly conspicuous when seen from neighbouring view points such as the Quantock Hills and Brean Down.

In a letter to the County Council, and also in evidence at the inquiry, the Central Electricity Authority has given a number of assurances in connection with this project. In particular, it intends to appoint a consultant in connection with the landscaping of the site and architects of the highest standing will be employed for the buildings. The Authority will also discuss the design of the buildings with the County Council at an early stage, and will consult with the County Council and the Williton Rural District Council on the question of providing public paths in substitution for rights of way which may need to be diverted or stopped up. Public access to the foreshore in the neighbourhood of the power station will have to be restricted only during the period of construction.

It is expected that the capacity of this station will be 500 MW. The highest building will be 175ft. There will, however, be no cooling towers or tall chimneys, and the very short vents about roof level will be hardly visible. The station will be connected with the 275 kV supergrid line which is planned to run between Melksham (nr. Bath) and Exeter, but it is intended that the route for this connection should be well clear of the Quantocks and Brean Down.

Alternative sites were considered near Clevedon, Portishead and Watchet, but none of these was suitable.

DOMESTIC ELECTRICAL EQUIPMENT

Electric Fires

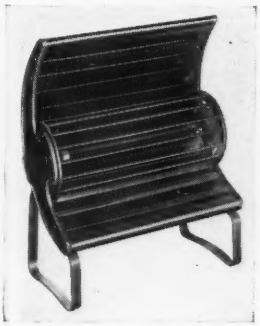
ONE of the most flexible of all forms of space heating, and the most easily controlled, the electric fire, has much that recommends it to the user, whether it be required for occasional use on chilly days or adopted as the main source of room heating. An indication of its popularity is reflected in the large number of manufacturers that we list in the following survey, in which particulars of approximately 400 models are given.

Electric fires are divided into two classes, the reflector type where a rod element is placed in front of a polished metal reflector, and the firebar pattern in which the spiral-wound element is laid in grooves formed in the surface of the fire clay former. Both provide radiant and convection heating, the proportion of radiant heat being in the region of 50 per cent for the firebar type and 70 per cent for the reflector fire. Most in demand are the reflector types which are claimed to reach their maximum heat output within two minutes of switching on. Apart from their greater concentration of heat, most of these are portable models and are provided with carrying handles enabling them to be easily taken from one room to another.

Several of the manufacturers have added to their ranges for the coming season and many new designs are being placed on the market. Among these is a very striking illuminated wall fire, the "Chameleon," introduced by Berry's Electric, Ltd. A new design of element is used and heat and light are blended to produce an attractive fireplace in a range of colours from glowing amber to cool green.

Manufacturer	Name or Model	Type	Total Loading	Elements	Finish	Price (excl. Tax)	Purchase Tax
ARTIC FUSE & ELECTRICAL MFG. CO., LTD., Birtley, Co. Durham.	"Sunnyglow"	Portable, floodlit reflector	1½ or 1½ kW	One 1½ or 1½ kW rod	Gold, silver, ivory, blue or green to order	£4 16 0	£2 3 2
	"Sunglade"	Portable, floodlit reflector	2½ or 3 kW	Two 1½ or 1½ kW rod	Gold, silver, ivory, blue or green to order	£9 7 3	£4 4 3
BELLING & CO., LTD., Bridge Works, Southbury Road, Enfield, Middlesex.	"Hotspur" 141 and 142	Portable reflector	1 or 2 kW	One or two 1 kW rod	Bronze or silver green	£2 15 0 (141) £3 10 0 (142)	£1 4 3 (141) £1 10 10 (142)
	"Dinkie" 601 and 602	Portable firebar	1 or 2 kW	One or two 1 kW bar	Bronze or silver green	£1 15 0 (601) £2 15 0 (602)	£0 15 5 (601) £1 4 3 (602)
	"Empire" 401E, 402E and 403E	Portable firebar	1, 2 or 3 kW	One, two or three 1 kW bar	Beige, pastel blue or green vitreous enamel	£2 10 0 (401E) £3 12 6 (402E) £4 15 0 (403E)	£1 2 0 (401E) £1 11 11 (402E) £2 1 10 (403E)
	"Solray" 151 and 152	Portable or wall mounting	1 or 2 kW	One or two 1 kW rod	Cream and black	£3 17 0 (151) £4 18 0 (152)	£1 13 11 (151) £2 3 2 (152)
	"Dainty" 226	Portable firebar	2 kW	Two 1 kW bar	Silver bronze or silver green	£3 15 0	£1 13 0
	"County" 231 and 232	Portable reflector	2 or 3 kW	Two or three 1 kW rod	Silver bronze or silver green	£5 2 6 (231) £6 2 6 (232)	£2 5 2 (231) £2 13 11 (232)
	"Modern" 228	Portable reflector	2 kW	Two 1 kW rod	Silver bronze or silver green	£6 10 0	£2 17 3
	"Cheery" 360	Imitation coal	2 kW	Two 1 kW bar	Silver bronze or silver green	£7 7 6	£3 4 11
	"Homeguard" 155	Portable safety reflector	2 kW	Two 1 kW	Silver bronze or silver green	£10 0 0	£4 8 0
	"Celtic" 753B	Period, log	3 kW	Three 1 kW (concealed)	Antique (rustless)	£29 15 0	£13 1 10
	"Adam" 743B	Period, coal	3 kW	Three 1 kW (concealed)	Armour bright (rustless)	£28 10 0	£12 10 10
	"Adam" 915 and 916	Period, firebar	2 or 3 kW	Two or three 1 kW bar	Armour bright (rustless)	£10 10 0 (915) £12 10 0 (916)	£4 12 5 (915) £5 10 0 (916)
	"Princess" 212 and 213	Imitation coal	2 or 3 kW	Two or three 1 kW rod	Bronze or silver green	£9 12 6 (212) £10 10 0 (213)	£4 4 9 (212) £4 12 5 (213)
	"Princess" 212A and 213A	Imitation log	2 or 3 kW	Two or three 1 kW rod	Bronze or silver green	£10 4 0 (212A) £11 2 0 (213A)	£4 9 10 (212A) £4 17 9 (213A)

Manufacturer	Name or Model	Type	Total Loading	Elements	Finish	Price (excl. Tax)	Purchase Tax
BELLING & CO., LTD., **Bridge Works, Southbury Road, Enfield, Middlesex.** *(continued)*	"Medieval" 639 and 639A	Imitation coal (639) or log (639A)	2 kW	Two 1 kW bar	Antique (rustless)	£12 12 6 (639) £14 2 6 (639A)	£5 11 2 (639) £6 4 4 (639A)
	"Waverley" 263 and 263P	Imitation coal, firebar	3 kW	Three 1 kW bar	Beige (263) or electro-plated bronze (263P)	£16 7 6 (263) £20 10 0 (263P)	£7 4 2 (263) £9 0 5 (263P)
	"Waverley" 264 and 264P	Imitation coal, reflector	3 kW	Three 1 kW rod	Beige (264) or electro-plated bronze (264P)	£17 2 6 (264) £21 5 0 (264P)	£7 10 9 (264) £9 7 0 (264P)
	"Melrose" 273 and 274	Illuminated, firebar (273) or reflector (274)	3 kW	Three 1 kW bar or rod	Beige	£14 5 0 (273) £15 0 0 (274)	£6 5 5 (273) £6 12 0 (274)
	"Converta" 178 and 179	Fireplace screen, firebar (178) or reflector (179)	2 kW	Two 1 kW bar or rod	Ripple bronze	£7 0 0 (178) £7 10 0 (179)	£3 1 8 (178) £3 6 0 (179)
	"Hearth" 159 and 159A	Imitation coal (159) or log (159A)	2 kW	Two 1 kW bar	Bright (rustless)	£7 17 6 (159) £9 12 6 (159A)	£3 9 4 (159) £4 4 9 (159A)
	C/1/131 and C/2/132	Panel, bronze inset	1 or 2 kW	One or two 1 kW bar	Bronze, cream, silver or silver green panel	£3 2 6 (C/1/131) £4 0 0 (C/2/132)	£1 7 7 (C/1/131) £1 15 4 (C/2/132)
	C/1A/131 and C/2A/132	Panel, chromium inset	1 or 2 kW	One or two 1 kW bar	Bronze, cream, silver or silver green panel	£3 12 6 (C/1A/131) £4 18 0 (C/2A/132)	£1 11 11 (C/1A/131) £2 3 2 (C/2A/132)
	F/2/133 (firebar) and G/2/133 (reflector)	Panel, bronze inset	2 kW	Two 1 kW bar or rod	Bronze, cream, silver or silver green panel	£5 7 6 (F/2/133) £5 18 0 (G/2/133)	£2 7 4 (F/2/133) £2 12 0 (G/2/133)
	F/2A/133 (firebar) and G/2A/133 (reflector)	Panel, chromium inset	2 kW	Two 1 kW bar or rod	Bronze, cream, silver or silver green	£6 5 0 (F/2A/133) £6 16 0 (G/2A/133)	£2 15 0 (F/2A/133) £2 19 11 (G/2A/133)
BERRY'S ELECTRIC, LTD., **Touchbutton House, Newman Street, London, W.1.**	"Adjustaberry" 457	Imitation fuel	2½ kW	Two 1¼ kW bar	Armour bright	£12 7 6	£5 8 7
	"Alderberry" 110	Imitation fuel	2 kW	Two 1 kW rod	Armour bright	£19 10 0	£8 11 1
	"Berrylog" A.21/O	Imitation fuel	1½ kW	Two ¾ kW bar	Satin antique	£10 12 6	£4 13 3
	"Berrylog" A.21/S	Imitation fuel	1½ kW	Two ¾ kW bar	Satin antique	£9 18 6	£4 7 1
	"Chameleon"	Illuminated, wall mounting	2 kW	Two 3-sectional 1 kW bar	Colour changes from glowing amber to cool green	To be announced	—
	"Dukesberry" 452	Imitation fuel	2 kW	Four ½ kW rod	Warm silver	£12 9 6	£5 9 6
	"Emberberry" 108	Imitation fuel	2 kW	Two 1 kW bar	Armour bright	£16 2 6	£7 1 6



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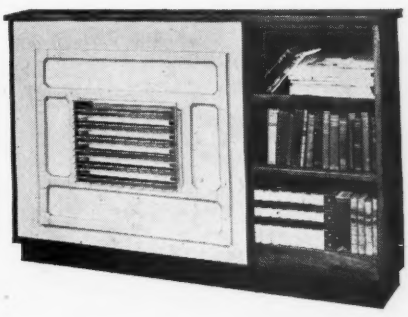

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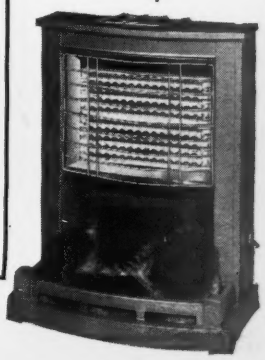
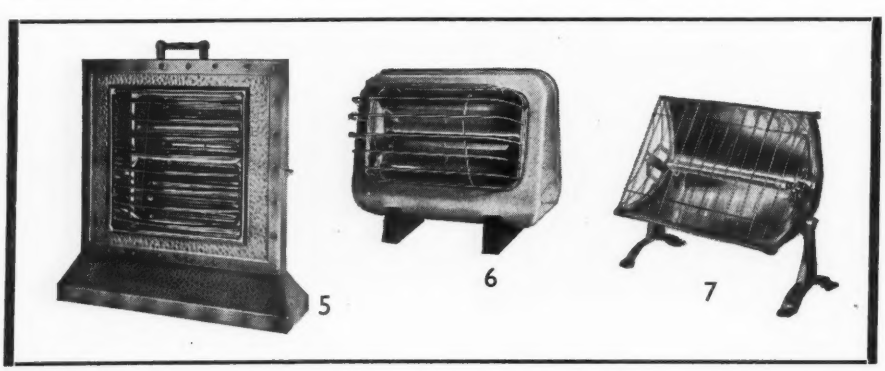


1. *Artic Fuse & Electrical Manufacturing Co.'s "Sunglade"*
2. *Berry's "Chameleon" inset fire*
3. *Berry's "Alderberry"*
4. *Belling "Cheery" coal effect model*

Manufacturer	Name or Model	Type	Total Loading	Elements	Finish	Price (excl. Tax)	Purchase Tax
BERRY'S ELECTRIC, LTD., Touchbutton House, Newman Street, London, W.1. *(continued)*	" Emberberry " 109 (with dogs)	Imitation fuel	2 kW	Two 1 kW bar	Armour bright	£18 8 6	£8 1 8
	" Homeberry " 442	Imitation fuel	2 kW	Two 1 kW rod	Warm silver	£9 12 6	£4 4 5
	" Masterberry " 444	Imitation fuel	2 kW	Four ½ kW rod	Warm silver	£15 10 0	£6 16 0
	" Masterberry " 555	Imitation fuel	3 kW	One 1 kW and one 2 kW bar	Warm silver	£15 17 6	£6 19 4
	" Masterglow " 333	Illuminated radiator	2 kW	Four ½ kW rod	Warm silver	£12 10 0	£5 9 8
	" Mayberry " 441	Imitation fuel	2 kW	Two 1 kW rod	Warm silver	£12 5 0	£5 7 6
	" Minorberry " 468	Imitation fuel	2 kW	Two 1 kW bar	Beige or oyster green	£7 19 6	£3 10 0
	" Vanguard " 628	Portable radiator	2 kW	Two 1 kW rod	Warm silver	£5 19 6	£2 12 5
	" Woodberry " 406	Imitation fuel	3 kW	Two 1½ kW bar	Armour bright	£15 17 6	£6 19 4
	" Adam Shell " 8	Imitation fuel	3 kW	Two 1½ kW rod	Antique bright (rustless)	£43 17 6	£20 10 8
	" Fleur-de-Lis " 40	Imitation fuel	3 kW	Two 1½ kW rod	Armour bright	£34 17 6	£16 6 5
	" Georgian " 2	Imitation fuel	3 kW	Two 1½ kW rod	Antique bright (rustless)	£37 17 6	£17 14 6
	" Jacobean " 5	Imitation fuel	3 kW	Two 1½ kW rod	Armour bright	£29 0 0	£13 11 5
	" Jacobean " 14 (with dogs)	Imitation fuel	3 kW	Two 1½ kW rod	Armour bright	£33 10 0	£15 13 7
	" Queen Anne " Pedestal 11	Imitation fuel	3 kW	Two 1½ kW rod	Antique bright (rustless)	£47 16 6	£22 7 8
	" Regency " 20	Imitation fuel	2 kW	Two 1 kW rod	Antique bright (rustless)	£37 5 0	£17 8 8
	" Wilton " 42	Imitation fuel	3 kW	Two 1½ kW rod	Antique bright (rustless)	£69 0 0	£32 5 10
	" Berrylog " A.28 (Special 36in)	Imitation fuel	—	Log effect only	—	£12 15 6	£5 19 7
	" Berrylog " A.28 (Standard 24in)	Imitation fuel	—	Log effect only	—	£9 0 0	£4 4 3
	Curb Heater 457	Radiator	2½ kW	Two 1¼ kW bar	—	£7 13 6	£3 11 9
	Curb Heater 98D	Radiator	2½ kW	Two 1¼ kW bar	—	£9 0 0	£4 4 3



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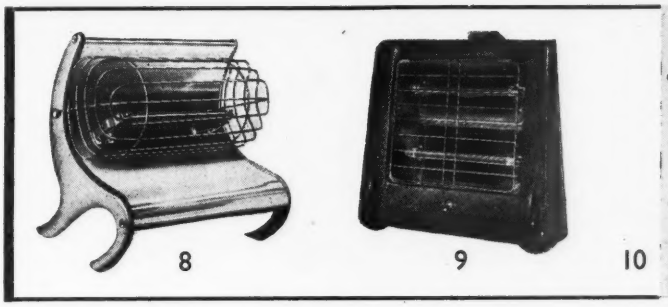
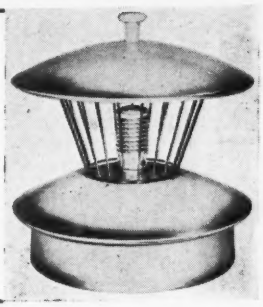
5. *Bulpitt "Cromwell"*

6. *Bulpitt "Waldorf"*

7. *C.W.S. "Derwent"*



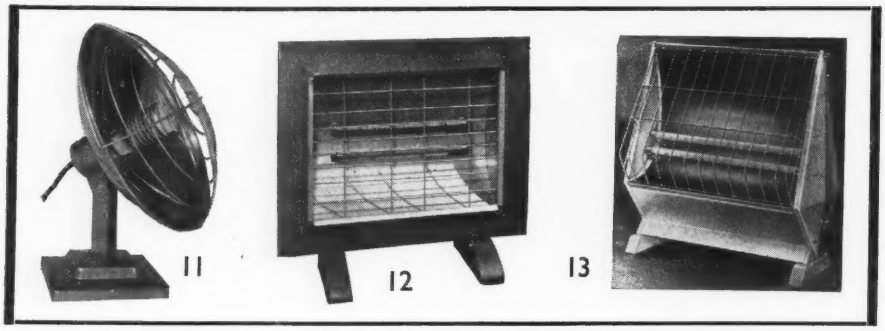


8. *Carron "Curtsey"*

9. *C.W.S. "Windsor"*

10. *Carron "Firebird"*

Manufacturer	Name or Model	Type	Total Loading	Elements	Finish	Price (excl. Tax)	Purchase Tax
BERRY'S ELECTRIC, LTD., Touchbutton House, Newman Street, London, W.1. *(continued)*	Curb Heater 98E	Radiator	2 kW	Two 1 kW bar	—	£9 0 0	£4 4 3
	Curb Heater 98E	Radiator	2¾ kW	Two 1¾ kW bar	—	£11 15 0	£5 10 0
	"Mistoberry" 417 (Single lighting)	Illuminated radiator	2 kW	Two 1 kW rod	Polished (rustless)	£22 1 0	£9 13 6
	"Mistoberry" 417 (Double lighting)	Illuminated radiator	2 kW	Two 1 kW rod	Polished (rustless)	£24 2 0	£10 11 6
BULPITT & SONS, LTD., St. George's Works, Icknield Street, Birmingham, 18.	"Waldorf" 821 and 822	Portable reflector	1 kW (821) and 2 kW (822)	One or two 1 kW rod	Red, grey, green and beige stoved enamel	£2 1 8 (821) £3 5 0 (822)	£0 18 4 (821) £1 8 6 (822)
	"Woodstock" 831 and 832	Portable reflector	1 kW (831) and 2 kW (832)	One or two 1 kW rod	Gold or silver stoved enamel, black base	£3 19 11 (831) £6 2 6 (832)	£1 15 1 (831) £2 13 9 (832)
	"Cromwell" 795	Portable reflector	2 kW	Two 1 kW rod	Armour bright or brass hammered	£9 4 11	£4 1 1
CARRON CO., Carron, Falkirk.	"Sirius"	Portable firebar	1 or 2 kW	One or two 1 kW bar	Vitreous enamel	£2 2 6 (1 kW) £3 7 6 (2 kW)	£0 18 8 (1 kW) £1 9 7 (2 kW)
	"Curtsey"	Portable reflector	1 or 2 kW	One or two 1 kW rod	"Carrontine"	£2 2 6 (1 kW) £3 1 6 (2 kW)	£0 18 8 (1 kW) £1 7 0 (2 kW)
	Pedestal	Portable reflector	1 or 2 kW	One or two 1 kW rod	Art silver	£2 19 0 (1 kW) £3 19 6 (2 kW)	£1 5 11 (1 kW) £1 14 11 (2 kW)
	"Sunglo"	Portable reflector	2½ kW	Two 1¼ kW rod	Chromium	£8 12 0	£3 15 6
	"Precentor"	Portable reflector	1 or 2 kW	Two 1 kW rod	"Carrontine," cream and gold	£3 16 0 (1 kW) £4 17 0 (2 kW)	£1 13 4 (1 kW) £2 2 6 (2 kW)
	"Firebird"	Portable firebar	1 kW	One 1 kW spiral	"Carrontine," various finishes	£2 15 0	£1 4 2
CO-OPERATIVE WHOLESALE SOCIETY, LTD., National Works, Hall Street, Dudley.	"Windsor"	Portable reflector	1 or 2 kW	One or two 1 kW rod	Honeydew or copper lustre	£3 0 0 (1 kW) £5 4 3 (2 kW)	£1 6 4 (1 kW) £2 5 9 (2 kW)
	"Eden"	Portable firebar	1 or 2 kW	One or two 1 kW bar	Grey or oyster green	£1 18 0 (1 kW) £2 18 0 (2 kW)	£0 16 8 (1 kW) £1 5 6 (2 kW)
	"Avon"	Portable firebar	1 or 2 kW	One or two 1 kW bar	Grey or oyster green	£1 7 3 (1 kW) £2 4 3 (2 kW)	£0 12 0 (1 kW) £0 19 5 (2 kW)
	"Derwent"	Portable or wall mounting reflector	1 kW	One 1 kW rod	Grey or oyster green	£2 3 9	£0 19 2
	Bowl	Portable reflector	600 W	One 600 W spiral	Chromium, cast base	£1 16 3	£0 15 11



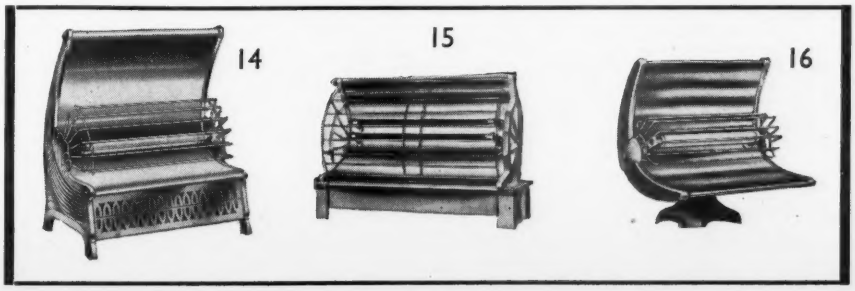
11. *Endo Industries E.656 bowl fire*

12. *Dexray Engineering Co.'s model R.22*

13. *A. D. Davidson "Diamond"*

Manufacturer	Name or Model	Type	Total Loading	Elements	Finish	Price (excl. Tax)	Purchase Tax
CRANMER & CHESHIRE, LTD., Steward Street, Spring Hill, Birmingham, 18.	"Nichro" 422	Portable tilting reflector	1 or 2 kW	One or two 1 kW rod	Silver grey	£3 5 0 (1 kW) £4 0 6 (2 kW)	£1 8 6 (1 kW) £1 15 4 (2 kW)
	"Nichro" 424	Portable double tilting reflector	2 kW	Two 1 kW rod	Silver grey	£5 10 0	£2 8 4
	"Nichro" 426	Wall fixing (bathroom)	1 kW	One 1 kW rod	Silver grey	£3 6 6	£1 9 2
	"Nichro" 429	Wall fixing (bathroom)	¾ kW	One ¾ kW rod	Silver grey	£3 3 0	£1 7 7
	"Nichro" 430	Portable tilting reflector	¾ or 1½ kW	One or two ¾ kW rod	Silver grey	£2 19 6 (¾ kW) £3 13 6 (1½ kW)	£1 6 1 (¾ kW) £1 12 3 (1½ kW)
	"Nichro" 438	Portable tilting reflector with glow lamp behind grille	2 kW	Two 1 kW rod	Silver grey	£5 15 0	£2 10 6
CROSSLANDS (RUGELEY), LTD., 55, Ebury Street, London, S.W.1.	"Raydant" 800/1 and 800/2	Portable reflector	1 or 2 kW	One or two 1 kW rod	Cream, red, silver or green	£2 7 6 (800/1) £3 4 2 (800/2)	£1 0 7 (800/1) £1 7 10 (800/2)
	"Raybar" 700/1 and 700/2	Portable firebar	1 or 2 kW	One or two 1 kW bar	Red, pale green or silver	£1 15 0 (700/1) £2 15 0 (700/2)	£0 15 2 (700/1) £1 3 10 (700/2)
A. D. DAVIDSON ELECTRIC CO., 62, Granville Street, Birmingham, 1.	"Davey" F.220 and F.221	Portable reflector	1 or 2 kW	One or two 1 kW rod	Chromium on brass	£2 11 6 (F.220) £3 16 0 (F.221)	£1 2 8 (F.220) £1 13 4 (F.221)
	"Diamond" F.230 and F.231	Portable reflector	1 or 2 kW	One or two 1 kW rod	Stone or pastel green	£2 17 6 (F.230) £3 5 6 (F.231)	£1 5 3 (F.230) £1 8 9 (F.231)
	"Davey" Bowl	Portable reflector	600 W	One 600 W spiral	Chromium on copper	£1 7 6	£0 12 1
DEXRAY ENGINEERING CO., LTD., 34, Ardwick Green South, Manchester, 13.	R.23	Portable reflector	2 kW	Two 1 kW rod	Hammer bronze or cream	£6 0 0	£2 14 0
	R.21 and R.22	Portable reflector	1 or 2 kW	One or two 1 kW rod	Bronze	£3 15 0 (R.21) £4 10 0 (R.22)	£1 13 9 (R.21) £2 0 6 (R.22)
	R.10	Portable or inset	2 kW	Two 1 kW rod	Cream or cream/gold	£6 5 0	£2 16 0
	R.15	Wall mounting	1 kW	One 1 kW rod	Cream and black	£3 10 0	£1 11 6
	R.33	Wall mounting	2 kW	Two 1 kW rod	Anodised bright gold panel, anodised copper reflectors	£32 10 0	£7 8 6
ELECTROWAY HEATERS, LTD., Rosebery Street, Loughborough, Leics.	IR12, VH2 and VH3	Inset, vertical reflector	1, 2 and 3 kW	One, two and three 1 kW rod	Chromium	£2 14 0 (IR12) £3 19 0 (VH2) £5 16 0 (VH3)	£1 3 9 (IR12) £1 14 8 (VH2) £2 11 1 (VH3)
	VK2 and IA2	Inset, vertical (VK2) and parabolic reflector (IA2)	2 kW	Two 1 kW rod	Chromium	£5 19 0 (VK2) £6 18 0 (IA2)	£2 12 4 (VK2) £3 0 8 (IA2)

Manufacturer	Name or Model	Type	Total Loading	Elements	Finish	Price (excl. Tax)	Purchase Tax
ELECTROWAY HEATERS, LTD., **Rosebery Street, Loughborough, Leics.** *(continued)*	IHIR, IH2R and IH3R	Inset, horizontal reflector	1, 2 and 3 kW	One, two and three 1 kW rod	Chromium	£3 5 0 (IHIR) £4 10 0 (IH2R) £7 6 0 (IH3R)	£1 8 6 (IHIR) £1 19 7 (IH2R) £3 4 3 (IH3R)
	IH1, IH2 and IH3	Inset, panel bar	1, 2 and 3 kW	One, two and three 1 kW bar	Chromium	£2 18 0 (IH1) £3 18 0 (IH2) £6 5 0 (IH3)	£1 5 6 (IH1) £1 14 3 (IH2) £2 14 11 (IH3)
	IE1R, IE2R and IE3R	Inset, horizontal reflector	1, 2 and 3 kW	One, two and three 1 kW rod	Stoved enamel	£2 7 0 (IE1R) £3 7 0 (IE2R) £5 12 0 (IE3R)	£1 0 8 (IE1R) £1 9 5 (IE2R) £2 9 3 (IE3R)
	IE1, IE2 and IE3	Inset, panel bar	1, 2 and 3 kW	One, two and three 1 kW bar	Stoved enamel	£2 2 0 (IE1) £3 0 0 (IE2) £4 11 0 (IE3)	£0 18 5 (IE1) £1 6 4 (IE2) £2 0 0 (IE3)
	IG1R and IG2R	Wall, horizontal reflector	1 and 2 kW	One or two 1 kW rod	Stoved enamel	£2 18 0 (IG1R) £4 2 0 (IG2R)	£1 5 6 (IG1R) £1 16 0 (IG2R)
	IG1 and IG2	Wall, panel bar	1 and 2 kW	One or two 1 kW bar	Stoved enamel	£2 14 0 (IG1) £3 7 0 (IG2)	£1 3 9 (IG1) £1 9 5 (IG2)
	WIR12, WVH2 and WVH3	Wall, vertical reflector	1, 2 and 3 kW	One, two and three 1 kW rod	Chromium, stoved enamel plaque	£4 3 0 (WIR12) £5 8 0 (WVH2) £7 5 0 (WVH3)	£1 16 6 (WIR12) £2 7 6 (WVH2) £3 3 9 (WVH3)
	WH2	Wall, panel bar	2 kW	Two 1 kW bar	Chromium, stoved enamel plaque	£5 7 0	£2 7 1
	WH2R	Wall, horizontal reflector	2 kW	Two 1 kW rod	Chromium, stoved enamel plaque	£6 0 0	£2 12 9
	WE2	Wall, panel bar	2 kW	Two 1 kW bar	Stoved enamel fire and plaque	£4 10 0	£1 19 7
	WE2R	Wall, horizontal reflector	2 kW	Two 1 kW rod	Stoved enamel fire and plaque	£4 18 0	£2 3 1
	IG2F	Wall, ring main, panel	2 kW	Two 1 kW bar	Chromium or stoved enamel	£4 1 0	£1 15 7
	R12	Wall, bathroom or portable	1 kW	One 1 kW rod	Hammered silver stoved enamel	£2 18 0	£1 5 6
	710 and 720	Portable, panel bar	1 and 2 kW	One or two 1 kW bar	Stoved enamel	£1 14 0 (710) £2 14 0 (720)	£0 14 11 (710) £1 3 9 (720)
	71 and 72	Portable, horizontal reflector	1 and 2 kW	One or two 1 kW rod	Stoved enamel	£2 2 0 (71) £3 7 0 (72)	£0 18 5 (71) £1 9 5 (72)
	R2	Portable, twin parabolic reflector	2 kW	Two 1 kW rod	Hammered silver	£5 2 0	£2 4 10
	410 and 410/2	Portable reflector	1 and 2 kW	One or two 1 kW rod	Hammered silver	£3 10 0 (410) £4 10 0 (410/2)	£1 10 9 (410) £1 19 7 (410/2)
ENDO INDUSTRIES, LTD., **97e, Westbourne Terrace, London, W.2.**	E.256 and E.356	Portable reflector	1 and 2 kW	One or two 1 kW rod	Grey hammer	£1 1 10 (E.256) £2 0 7 (E.356)	£0 8 1 (E.256) £0 15 11 (E.356)
	E.656	Portable bowl	600 W	One 600 W spiral	Gold hammer	£0 19 2	£0 7 4

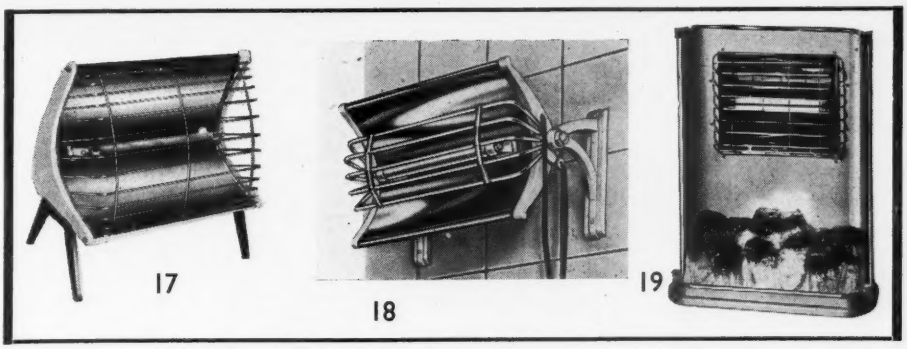


14. *Cranmer & Cheshire "Nichro" 438*

15. *Crossland "Raydant"*

16. *Electroway Heaters model 410*

Manufacturer	Name or Model	Type	Total Loading	Elements	Finish	Price (excl. Tax)	Purchase Tax
FALKIRK IRON CO., LTD., Falkirk, Stirlingshire.	41	Portable reflector	2 kW	Two 1 kW rod	Stove enamelled, various colours	£3 1 8	£1 6 9
	"Firefly" 43	Portable reflector	1 kW	One 1 kW rod	Stove enamelled, various colours	£2 1 0	£0 18 0
FALK, STADELMANN & CO., LTD., 91, Farringdon Road, London, E.C.1.	"Serenity"	Portable reflector, illuminated screen	2 kW	Two 1 kW rod	Polychromatic gold	£10 8 6	£4 11 6
	"Felicity"	Portable reflector, illuminated screen	2 kW	Two 1 kW rod	Polychromatic gold or cream	£6 18 8	£3 0 10
	"Gaiety"	Portable reflector, illuminated	2 kW	Two 1 kW rod	Gold	£5 10 0	£2 8 3
	"Festivity"	Reflector, illuminated	2 kW	Two 1 kW rod	Gold	£9 0 0	£3 19 0
	"Economist"	Portable reflector	1 or 2 kW	One or two 1 kW rod	Cream with black, green or red feet	£2 2 0 (1 kW) £2 15 0 (2 kW)	£0 18 5 (1 kW) £1 4 2 (2 kW)
	"Bathroom"	Wall mounting reflector	1 kW	One 1 kW rod	Cream	£3 2 6	£1 7 6
	"Olympian"	Portable reflector	1 or 2 kW	One or two 1 kW rod	Bronze, blue and silver, green and silver	£1 18 0 (1 kW) £2 12 0 (2 kW)	£0 16 8 (1 kW) £1 2 10 (2 kW)
	"Eclipse"	Portable reflector	1 or 2 kW	One or two 1 kW rod	Grey	£1 14 9 (1 kW) £2 12 6 (2 kW)	£0 15 3 (1 kW) £1 3 0 (2 kW)
	"Comet"	Portable reflector	750 W or 1 kW	One 750 W or 1 kW rod	Off-white and black	£1 18 7 (750 W) £1 19 11 (1 kW)	£0 16 11 (750 W) £0 17 7 (1 kW)
	"Meteor"	Portable reflector	1 or 2 kW	One or two 1 kW rod	Off-white and black	£3 2 7 (1 kW) £3 16 5 (2 kW)	£1 7 5 (1 kW) £1 13 7 (2 kW)
	U.95664	Portable 10in bowl reflector	600 W	One 600 W spiral	Grey or cream	£1 6 0	£0 11 5
	U.95733	Portable 12in bowl reflector	750 W	One 750 W spiral	Cream, chromium bowl	£1 18 11	£0 17 1
FERRANTI, LTD., Hollinwood, Lancs.	"Victor 10" F.4144	Floor reflector	1 kW	One 1 kW rod	Cream enamel, chromium or solium reflector	£2 14 9	£1 4 0
	"Victor 20" F.5164	Floor reflector	2 kW	Two 1 kW rod	Cream enamel, chromium or solium reflector	£3 9 6	£1 10 6
	"Victor 25" F.6175	Floor reflector	2½ kW	Two 1¼ kW rod	Cream enamel, chromium reflector	£5 0 0	£2 3 11
	W.5148	Wall reflector (bathrooms, etc.)	1 kW	One 1 kW rod	Cream or silver, chromium guard and reflector	£3 15 0	£1 12 11
	W.5150	Wall reflector (bathrooms, etc.)	1¼ kW	One 1¼ kW rod	Cream or silver, chromium guard and reflector	£4 10 0	£1 19 6
	"Flamera" F.6186	Floor reflector, imitation fuel	2 kW	Two 1 kW rod	Silver enamel, chromium reflector	£10 18 3	£4 15 9
	"Minor" P.5160	Builders' fire reflector	2 kW	Two 1 kW rod	Bronze and cream, chromium or solium reflector	£4 11 8	£2 0 3
	P.3310	Panel reflector, ventilating grille	2½ kW	Two 1¼ kW rod	Chromium reflector, frame and decorative screen	£24 10 6 £3 5 0 (decorative screen)	£10 15 3
	P.33132	Panel reflector	2 kW	Two 1 kW rod	Chromium reflector, frame and guard	£16 2 6	£7 1 6
	P.33122	Panel reflector	1¼ kW	Two ⅝ kW rod	Chromium reflector, frame and guard	£12 10 0	£5 9 8
FORMO PRODUCTS, LTD., 153, Masons Hill, Bromley, Kent.	"Sunnyheat"	Portable reflector	1 kW	One 1 kW rod	Ivory stove enamelled	£1 16 7½	£0 15 10½

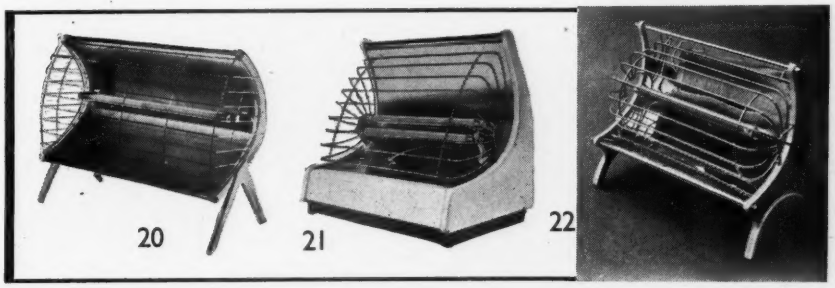


17. *Falk, Stadelmann's "Comet"*

18. *Formo Products "Sunnyheat" infra-red bathroom fire*

19. *Ferranti "Flamera"*

Manufacturer	Name or Model	Type	Total Loading	Elements	Finish	Price (excl. Tax)	Purchase Tax
FORMO PRODUCTS, LTD., 153, Masons Hill, Bromley, Kent. *(continued)*	"Sunnyheat"	Portable reflector	2 kW	Two 1 kW rod	Ivory stove enamelled	£2 12 4	£1 2 9
	"Sunnyheat" Bathroom	Portable reflector	600 W	One 600 W infra-red rod	Ivory stove enamelled	£2 12 4	£1 2 8
H. FROST & CO., LTD., Walsall.	"Sunhouse" 147 and 148	Portable panel bar	1 kW (147) and 2 kW (148)	One and two 1 kW bar	Red, green or lemon with chromium	£2 1 6 (147) £3 0 0 (148)	£0 18 0 (147) £1 6 0 (148)
	"Sunhouse" 261 and 262	Portable reflector	1 kW (261) and 2 kW (262)	One and two 1 kW rod	Chromium and matt black or red, green or lemon with chromium	£2 7 6 (261) £3 3 0 (262)	£1 0 7 (261) £1 7 4 (262)
	"Sunhouse" 163	Bathroom reflector	1 kW	One 1 kW rod	Cream	£3 13 6	£1 11 10
	"Sunhouse" 172 and 172 C.P.	Inset reflector	2 kW	Two 1 kW rod	Brown hammered stoved enamel (172) and chromium (172 C.P.)	£4 13 0 (172) £6 10 0 (172 C.P.)	£2 0 3 (172) £2 16 4 (172 C.P.)
	"Sunhouse" 177 and 177 C.P.	Inset reflector	1 kW	One 1 kW rod	Brown hammered stoved enamel (177) and chromium (177 C.P.)	£2 3 0 (177) £2 16 9 (177 C.P.)	£0 18 7 (177) £1 4 7 (177 C.P.)
	"Sunhouse" A.17 and A.17 C.P.	Inset reflector	2 kW	Two 1 kW rod	Brown hammered stoved enamel (A.17) and chromium (A.17 C.P.)	£3 13 6 (A.17) £4 14 6 (A.17 C.P.)	£1 11 10 (A.17) £2 1 0 (A.17 C.P.)
	"Sunhouse" B.17 and B.17 C.P.	Inset reflector	1 kW	One 1 kW rod	Brown hammered stoved enamel (B.17) and chromium (B.17 C.P.)	£2 7 0 (B.17) £3 11 0 (B.17 C.P.)	£1 0 4 (B.17) £1 10 9 (B.17 C.P.)
	"Sunhouse" A.14 and A.14 C.P.	Inset panel bar	1 kW	One 1 kW bar	Brown hammered stoved enamel (A.14) and chromium (A.14 C.P.)	£2 4 0 (A.14) £3 10 0 (A.14 C.P.)	£0 19 0 (A.14) £1 10 4 (A.14 C.P.)
	"Sunhouse" A.24 and A.24 C.P.	Inset panel bar	2 kW	Two 1 kW bar	Brown hammered stoved enamel (A.24) and chromium (A.24 C.P.)	£3 6 6 (A.24) £4 13 0 (A.24 C.P.)	£1 8 10 (A.24) £2 0 3 (A.24 C.P.)
	"Sunhouse" 4021 and 7021	Inset reflector	2 kW	Two 1 kW rod	Brown hammered stoved enamel	£4 16 7 (4021) £7 2 10 (7021)	£2 1 10 (4021) £3 1 11 (7021)

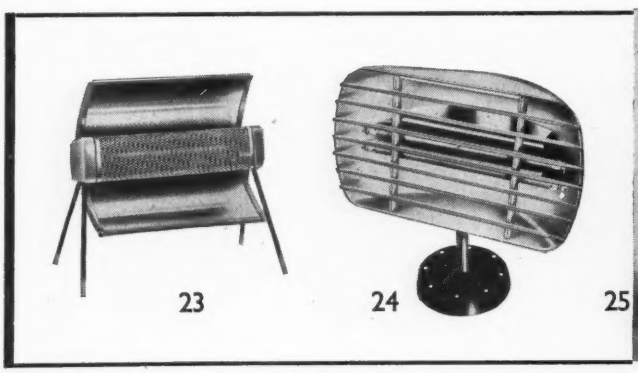


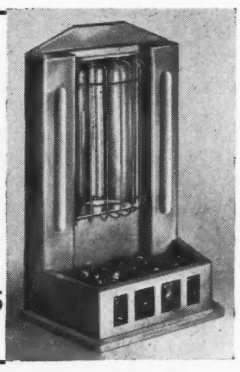
20. *Ferranti "Victor 25"*

21. *Falk, Stadelmann's "Meteor"*

22. *Falkirk Iron Co.'s "Firefly"*

Manufacturer	Name or Model	Type	Total Loading	Elements	Finish	Price (excl. Tax)	Purchase Tax
H. FROST & CO., LTD., Walsall. (*continued*)	"Sunhouse" 7031	Inset reflector	3 kW	Two 1½ kW rod	Brown hammered stoved enamel	£7 11 9	£3 5 9
	"Sunhouse" 401 and 402	Wall panel reflector	1 or 2 kW	One or two 1 kW rod	Brown hammered stoved enamel	£2 12 0 (401) £3 17 2 (402)	£1 2 6 (401) £1 13 6 (402)
	"Sunhouse" 403 and 404	Wall panel bar	1 or 2 kW	One or two 1 kW bar	Brown hammered stoved enamel	£2 11 0 (403) £3 15 0 (404)	£1 2 1 (403) £1 12 6 (404)
	"Sunhouse" 4020 and 7020	Wall panel reflector	2 kW	Two 1 kW rod	Brown hammered stoved enamel	£5 11 0 (4020) £9 8 6 (7020)	£2 9 10 (4020) £4 1 8 (7020)
	"Sunhouse" 7030	Wall panel reflector	3 kW	Two 1½ kW rod	Brown hammered stoved enamel	£9 17 5	£4 5 6
	"Sunhouse" 602 and 7061	Wall panel reflector	2 kW	Two 1 kW rod	Brown hammered stoved enamel	£4 6 6 (602) £4 0 0 (7061)	£1 17 1 (602) £1 14 8 (7061)
G.B.M. (ELECTRICAL) BIRMINGHAM, LTD., 439, Moseley Road, Birmingham, 12.	R.F.1	Portable reflector	1 kW	One 1 kW rod	Cream	£1 7 6	£0 16 6
	R.F.2	Portable reflector	2 kW	Two 1 kW rod	Cream and black	£2 8 0	£1 8 9
GATEHILL MFG. CO., LTD., Kennard Road, Stratford, E.15.	"Comfy"	Portable reflector	1 kW	One 1 kW rod	Hammered green, silver	£0 18 6	£0 8 0
	"Windsor"	Portable reflector	1 kW	One 1 kW rod	Silver hammered	£1 3 0	£0 9 11
	"Sunshine"	Portable reflector	1 or 2 kW	One or two 1 kW rod	Maroon and grey	£1 6 6 (1 kW) £1 12 6 (2 kW)	£0 9 6 (1 kW) £0 11 8 (2 kW)
	"Sunglo"	Portable fire bar	1 or 2 kW	One or two 1 kW bar	Hammered gold	£0 17 8 (1 kW) £1 10 0 (2 kW)	£0 7 1 (1 kW) £0 10 9 (2 kW)
	"Richmond"	Portable reflector	1 or 2 kW	One or two 1 kW rod	Gold and mushroom	£1 9 5 (1 kW) £2 4 11 (2 kW)	£0 12 8 (1 kW) £0 19 5 (2 kW)
	10in Bowl	Portable bowl	600/750 W	600 or 750 W spiral	Aluminium with silver base	£1 1 9	£0 9 5
	12in Bowl	Portable bowl	600/750 W	600 or 750 W spiral	Aluminium with black wrinkle base	£1 5 0	£0 10 6
GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2.	D.2342G	Portable firebar	2 kW	Two 1 kW bar	Beige or green vitreous enamel	£3 16 0	£1 13 4
	D.2391G	Inset	1 kW	One 1 kW bar	Bronze (*a*) or hammered bronze (*b*)	£2 4 0 (*a*) £2 8 0 (*b*)	£0 19 4 (*a*) £1 1 1 (*b*)
	D.2392G	Inset	2 kW	Two 1 kW bar	Bronze (*a*) or hammered bronze (*b*)	£3 8 0 (*a*) £3 12 0 (*b*)	£1 9 10 (*a*) £1 11 7 (*b*)

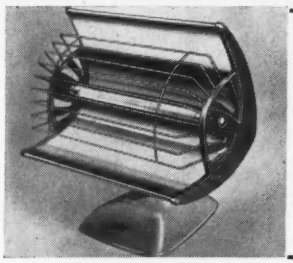




23. *G.E.C. model D.2775*

24. *G.E.C. "Cosyglo" model D.2815*

25. *Grafton 750 W coal effect model*



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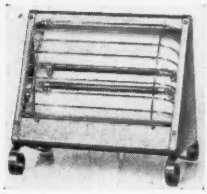

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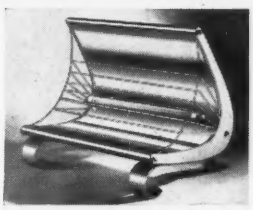

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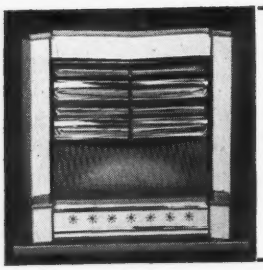
26. *L. G. Hawkins "Loughton"*

27. *Grubb Engineering Co.'s 2 kW model*

28. *L. G. Hawkins "Boomerang"*

Manufacturer	Name or Model	Type	Total Loading	Elements	Finish	Price (excl. Tax)	Purchase Tax
GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2. *(continued)*	D.2394G and D.2395G	Wall mounting	1 or 2 kW	One or two 1 kW bar	Beige vitreous enamel	£3 10 0 (D.2394G) £4 15 0 (D.2395G)	£1 10 9 (D.2394G) £2 1 8 (D.2395G)
	D.2496G and D.2497G	Portable firebar	1 or 2 kW	One or two 1 kW bar	Bronze, cream or green	£1 16 6 (D.2496G) £2 15 0 (D.2497G)	£0 16 0 (D.2496G) £1 4 2 (D.2497G)
	D.2757	Pedestal bowl	750 W	One 750 W spiral	Cream	£1 17 6	£0 16 5
	D.2766 and D.2767	Portable or wall mounting reflector	1 or 2 kW	One or two 1 kW rod	Cream	£3 5 6 (D.2766) £4 3 0 (D.2767)	£1 8 9 (D.2766) £1 16 5 (D.2767)
	D.2768	High level, wall mounting	1 kW	One 1 kW rod	Cream	£2 15 6	£1 4 4
	"Cosyglo" D.2812 and D.2813	Portable reflector	2 kW	Two 1 kW rod	Cream or silver bronze (*a*) or green or silver bronze (*b*)	£4 18 6 (*a*) £5 15 0 (*b*)	£2 3 3 (*a*) £2 10 5 (*b*)
	"Cosyglo" D.2814	Screen reflector	2 kW	Two 1 kW rod	Hammered bronze	£11 10 0	£5 0 11
	"Cosyglo" D.2815	Portable reflector, pedestal	2 kW	Two 1 kW rod	Moonstone grey, black base, with yellow relief	£4 18 6	£2 3 3
	D.2773 and D.2774	Portable reflector	1 or 2 kW	One or two 1 kW rod	Cream or silver bronze	£2 15 0 (D.2773) £3 12 6 (D.2774)	£1 4 2 (D.2773) £1 11 10 (D.2774)
	D.2775	Portable reflector	2 kW	Two 1 kW rod	Moonstone grey and burgundy with black legs	£4 16 0	£2 2 1
	"Cosyglow" D.2852G	Inset	2 kW	Two 1 kW rod	Bronze (*a*) or hammered bronze (*b*)	£5 11 6 (*a*) £5 16 0 (*b*)	£2 8 11 (*a*) £2 10 11 (*b*)
	"Cosyglo" D.2853	Wall mounting	2 kW	Two 1 kW rod	Cream or hammered bronze	£6 8 0	£2 16 2
GRAFTON HEATER CO., LTD., 13-15, Westland Place, London, N.1.	1056	Portable reflector, coal effect	750 W	One 750 W rod	Various colours	£2 13 6	£1 3 8
	1060	Bowl	600 W	One 600 W E.S.	Various colours	£1 1 0	£0 9 6
	1055	Portable reflector	1 kW	One 1 kW rod	Various colours	£1 5 0	£0 10 6
	1055/2	Portable reflector	2 kW	Two 1 kW rod	Various colours	£2 0 0	£0 18 0
GRUBB ENGINEERING CO., LTD., Mary Street, Balsall Heath, Birmingham, 12.	"Grubb"	Portable reflector	1 or 2 kW	One or two 1 kW rod	Cream, eau-de-nil, silver or gilt	£2 17 6 (1 kW) £3 7 6 (2 kW)	£1 5 2 (1 kW) £1 9 7 (2 kW)
L. G. HAWKINS & CO., LTD., 30-35, Drury Lane, London, W.C.2.	"Boomerang" LGH.339 and LGH.340	Portable reflector	1 or 2 kW	One or two 1 kW rod	Brown, mushroom and cream	£2 19 0 (339) £3 12 11 (340)	£1 5 11 (339) £1 12 0 (340)
	"Three-way" LGH.336	Portable reflector	1 kW	One 1 kW rod	Brown, mushroom and cream	£1 12 6	£0 14 3
	"Pixie" LGH.31	Portable reflector	1 kW	One 1 kW rod	Mushroom, silver or cream	£1 18 7	£0 16 11



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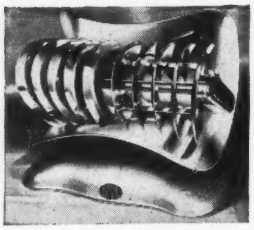

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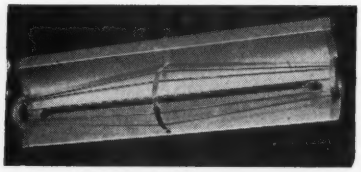

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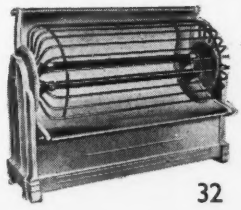
29. *Heatrae "Majestic"*

30. *H.M.V. "Lincoln"*

31. *Heatrae "Saferod"*

Manufacturer	Name or Model	Type	Total Loading	Elements	Finish	Price (excl. Tax)	Purchase Tax
L. G. HAWKINS & CO., LTD., 30-35, Drury Lane, London, W.C.2. *(continued)*	"Marilyn" LGH.34	Portable reflector	1 kW	One 1 kW rod	Ivory, silver or mushroom	£2 3 11	£0 19 3
	"Loughton" LGH.337 and LGH.338	Pedestal reflector	1 or 2 kW	One or two 1 kW rod	Maroon and dove grey and all-cream	£3 9 0 (337) £4 2 9 (338)	£1 10 3 (337) £1 16 4 (338)
HEATRAE, LTD., Heatrae Works, Norwich.	"Saferod"	Reflector, wall mounting	1 kW	One 1 kW rod	Mushroom and chromium	£4 9 6	£1 19 3
	"Pilot"	Portable reflector	1 kW	One 1 kW rod	Ivory tan	£4 9 6	£1 19 3
	"Dandy"	Portable reflector	2 kW	Two 1 kW rod	Ivory tan	£8 2 0	£3 11 1
	"Majestic"	Reflector, floor mounting	2 kW	Two 1 kW rod	Cameo fawn and pebble grey	£12 12 0	£5 10 6
H.M.V. HOUSEHOLD APPLIANCES, Hayes, Middlesex.	"Lincoln" F3 and 2/F3	Multi-parabola reflector	2 or 3 kW	Two 1 or 1½ kW rod	Maroon, rifle green or grey hammer base	£6 18 8	£3 0 10
	"Ely" F1	Multi-parabola reflector	1 kW	One 1 kW rod	Grey hammer base	£2 17 4	£1 5 2
HOTPOINT ELECTRIC APPLIANCE CO., LTD., Fletton, Peterborough.	HF.151	Portable reflector	1 kW	One 1 kW rod	Cream and chromium	£2 10 0	£1 2 0
	HF.152	Portable reflector	2 kW	Two 1 kW rod	Cream and chromium	£3 0 0	£1 6 4
	"Hystan" 5550/1/2	Portable reflector	2 kW	Two 1 kW rod	Cream, yellow and black, red and yellow	£5 2 2	£2 4 10
C. HOUNSLOW & CO., LTD., Chalex Works, Southwick, Sussex.	"Angular" 3007	Wall mounting reflector	1 kW	One 1 kW rod	Cream	£2 12 6	£1 3 2
	"Albemarle" 3008	Portable, imitation coal effect	2 kW	Two 1 kW rod	Gold, flecked cream	£7 0 2	£3 1 10
	"Vertic" 3005 and 3006	Portable reflector	1 or 2 kW	One or two 1 kW rod	Pastel cream and grey copper	£1 12 7 (3005) £2 12 6 (3006)	£0 14 5 (3005) £1 3 2 (3006)
	"Standard" 3001 and 3002	Portable firebar	1 or 2 kW	One or two 1 kW bar	Copper bronze	£1 12 7 (3001) £2 11 9 (3002)	£0 14 5 (3001) £1 2 10 (3002)
	"Standard" 3003 and 3004	Portable reflector	1 or 2 kW	One or two 1 kW rod	Copper bronze	£2 1 6 (3003) £3 1 5 (3004)	£0 18 4 (3003) £1 7 1 (3004)
JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, London, S.W.1.	251J	Inset reflector	2 kW	Two 1 kW rod	Chromium	£4 10 0	£1 19 6
	252J	Panel reflector	2 kW	Two 1 kW rod	Chromium and mushroom panel	£5 5 0	£2 6 1
	253J	Portable reflector	2 kW	Two 1 kW rod	Chromium	£4 17 6	£2 2 10
	731J and 732J	Portable reflector	1 or 2 kW	One or two 1 kW rod	Willow green, citron yellow, Dresden blue	£2 15 0 (731J) £3 10 0 (732J)	£1 4 3 (731J) £1 10 8 (732J)

Manufacturer	Name or Model	Type	Total Loading	Elements	Finish	Price (excl. Tax)	Purchase Tax
JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, London, S.W.1. *(continued)*	756J and 757J	Adjustable, portable	1 or 2 kW	One or two 1 kW rod	Various "house and garden" colours	£3 15 0 (756J) £4 15 0 (757J)	£1 12 11 (756J) £2 1 8 (757J)
	758J	Adjustable, wall mounting	1 kW	One 1 kW rod	Black and cream	£3 17 6	£1 14 0
MARSDEN & BATESON, LTD., 67-69, Scholefield Street, Nechells, Birmingham, 7.	"Marbat" 1 and 2	Inset firebar	1 or 2 kW	One or two 1 kW bar	Hammered bronze or silver	£1 19 0 (1) £3 0 0 (2)	£0 17 3 (1) £1 6 7 (2)
	"Marbat" 3 and 4	Wall panel, firebar	1 or 2 kW	One or two 1 kW bar	Hammered bronze or silver	£2 4 9 (3) £3 8 9 (4)	£0 19 10 (3) £1 10 5 (4)
	"Marbat" bowl	Portable or wall mounting	600 W	One 600 W spiral	Copper (*a*) or aluminium (*b*)	£2 5 0 (*a*) £1 18 6 (*b*)	£0 19 11 (*a*) £0 17 0 (*b*)
METWAY ELECTRICAL INDUSTRIES, LTD., Canning Street, Kemp Town, Brighton, 7.	"Minorway"	Small portable reflector	750 W	One 750 W rod	Mottled silver	£1 6 9	£0 11 6
	"Cradleway"	Small portable reflector	1 kW	One 1 kW rod	Mottled silver, chromium stand	£1 10 9	£0 13 4
	"Magnaway" one and two	Portable reflector	1 or 2 kW	One or two 1 kW rod	Mottled silver and chromium	£2 9 6 (one) £3 1 0 (two)	£1 1 5 (one) £1 6 5 (two)
	"Mirrorway"	Portable bowl	750 W	One 750 W spiral	Plain aluminium	£1 1 9	£0 9 5
	"Marvelway"	Portable bowl	1 kW	One 1 kW spiral	Fluted aluminium	£1 13 3	£0 14 5
	"Superway"	Portable bowl	600 W	One 600 W spiral	Plain aluminium	£0 18 6	£0 6 6
MIDLAND ELECTRIC MFG. CO., LTD., M.E.M. Works, Reddings Lane, Birmingham, 11.	"Memray"	Portable, swivelled reflector	1 or 2 kW	One or two 1 kW rod	Bronze or cream	£2 17 4 (1 kW) £4 7 4 (2 kW)	£1 5 2 (1 kW) £1 18 4 (2 kW)
	"Reflex"	Portable, fixed reflector	1 or 2 kW	One or two 1 kW rod	Mushroom or mottled stone	£2 14 0 (1 kW) £4 3 0 (2 kW)	£1 3 8 (1 kW) £1 16 5 (2 kW)
	"Memglo"	Portable flat bar	1 or 2 kW	One or two 1 kW bar	Mottled stone	£2 2 0 (1 kW) £3 0 0 (2 kW)	£0 18 5 (1 kW) £1 6 4 (2 kW)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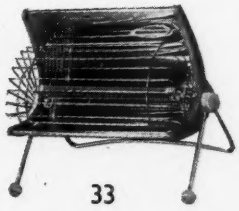
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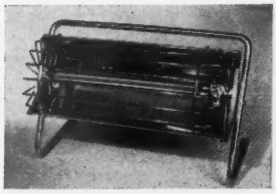
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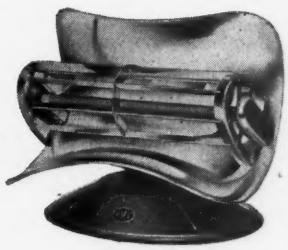
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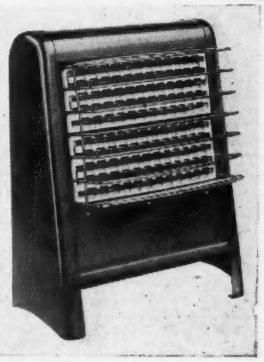


32. *M.E.M. "Memray"*

33. *Jackson 757J 2 kW model*

34. *Metway "Cradleway"*

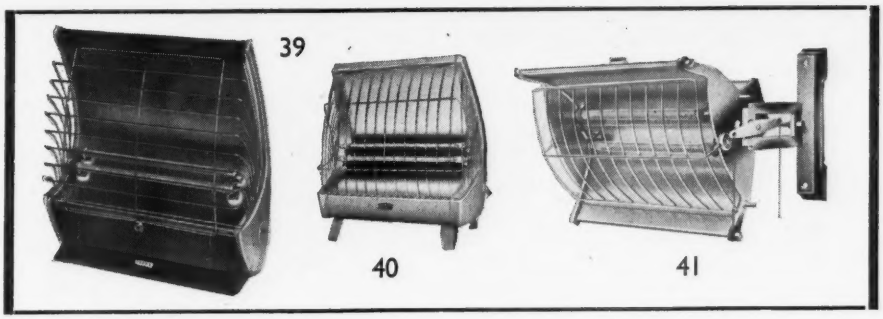
35. *Metway bowl fire*

36. *Hotpoint "Hystan"*

37. *H.M.V. "Ely"*

38. *M.E.M. "Memglo"*

Manufacturer	Name or Model	Type	Total Loading	Elements	Finish	Price (excl. Tax)	Purchase Tax
MIDLAND ELECTRIC MFG. CO., LTD., M.E.M. Works, Reddings Lane, Birmingham, 11. *(continued)*	"Walray"	Inset reflector	2 kW	Two 1 kW rod	Mushroom or mottled stone	£7 0 0	£3 1 5
	"Walbeam"	Outset flat bar	1 or 2 kW	One or two 1 kW bar	Mushroom or mottled stone	£2 19 8 (1 kW) £4 15 0 (2 kW)	£1 6 2 (1 kW) £2 1 8 (2 kW)
MONARCH ELECTRIC, LTD., Vicarage Road, Lye, Worcs.	"Doric" 501	Portable firebar	1 kW	One 1 kW bar	Dimenso enamel	£1 11 6	£0 13 10
	"Doric" 502	Portable firebar	2 kW	Two 1 kW bar	Dimenso enamel	£2 8 0	£1 1 1
T. B. MORLEY & CO., LTD., Jameson Street, Hull.	"Don"	Portable reflector	750 W to 2 kW	One or two 750 W or 1 kW rod	Cream	£2 11 0 (750 W) £2 14 0 (1 kW) £3 3 0 (1½ kW) £3 9 0 (2 kW)	£1 2 5 (750 W) £1 3 9 (1 kW) £1 7 9 (1½ kW) £1 10 5 (2 kW)
	"Humber"	Portable reflector	750 W or 1,500 W	One or two 750 W rod	Cream	£2 12 0 (750 W) £3 3 0 (1½ kW)	£1 2 11 (750 W) £1 7 9 (1½ kW)
	"Derwent"	Portable reflector	1 or 2 kW	One or two 1 kW rod	Cream	£2 13 0 (1 kW) £3 8 0 (2 kW)	£1 3 4 (1 kW) £1 9 11 (2 kW)
	"Thames"	Portable twin reflector	750 W or 1,500 W	One or two 750 W rod	Bronze	£1 14 6 (750 W) £2 12 6 (1½ kW)	£0 15 2 (750 W) £1 3 1 (1½ kW)
	"Severn"	Portable firebar	1 or 2 kW	One or two 1 kW bar	Bronze	£1 13 0 (1 kW) £2 10 0 (2 kW)	£0 14 6 (1 kW) £1 2 0 (2 kW)
	"Aire"	Portable reflector	1 or 2 kW	One or two 1 kW rod	Cream	£2 12 0 (1 kW) £3 7 0 (2 kW)	£1 2 11 (1 kW) £1 9 6 (2 kW)
	"Morco" bowl	Portable reflector	600 W	One 600 W spiral	Cream	£1 8 6	£0 12 6
MORPHY-RICHARDS, LTD., 6, Conduit Street, London, W.1.	"Avon" FA/10 and FA/20	Portable reflector	1 kW (FA/10) and 2 kW (FA/20)	One or two 1 kW rod	Beige	£3 10 0 (FA/10) £4 5 0 (FA/20)	£1 10 4 (FA/10) £1 16 10 (FA/20)
	"Cray" FC/750 and FC/15	Portable reflector	750 W (FC/750) and 1½ kW (FC/15)	One or two 750 W rod	Beige	£2 2 0 (FC/750) £2 12 6 (FC/15)	£0 18 3 (FC/750) £1 2 9 (FC/15)
	"Cray" FC/10 and FC/20	Portable reflector	1 kW (FC/10) and 2 kW (FC/20)	One or two 1 kW rod	Beige	£2 6 6 (FC/10) £2 17 6 (FC/20)	£1 0 2 (FC/10) £1 4 11 (FC/20)
NICO LIGHT ENGINEERING CO., LTD., 1, Laud Street, Croydon.	"Reflecta-Ray"	Portable bowl	600 W	One 600 W spiral	Polished copper, ivory or black base	£1 5 0	£0 11 0
PIFCO, LTD., Watling Street, Manchester, 4.	"Sheridan" 491	Portable reflector	1 kW	One 1 kW rod	Hammered silver grey or gold	£1 18 7	£0 16 11
PREMIER ELECTRIC HEATERS, Kealey Street, Birmingham, 9.	"Parabain" 5321	Wall mounting reflector	1 kW	One 1 kW rod	Ivory	£3 9 6	£1 10 6
	"Paraglow" 5380/1 and 5390/1	Portable reflector	1 or 2 kW	One or two 1 kW rod	Cream or bronze	£2 5 0 (5380/1) £2 15 0 (5390/1)	£0 19 10 (5380/1) £1 4 2 (5390/1)
	"Jewel" 5510/1 and 5520/1	Portable reflector	1 or 2 kW	One or two 1 kW rod	Green or cream	£1 17 6 (5510/1) £4 10 0 (5520/1)	£0 16 6 (5510/1) £1 19 6 (5520/1)
	"Parabeau" 5472	Portable reflector	2 kW	Two 1 kW rod	Gilt	£5 15 0	£2 10 6
	"Guardian" 5401, 5402 and 5403	Portable reflector	2 kW	Two 1 kW rod	Gold (5401) Pink (5402) Blue (5403)	£6 0 0	£2 12 8



39. *Simplex "Creda Cubana"*

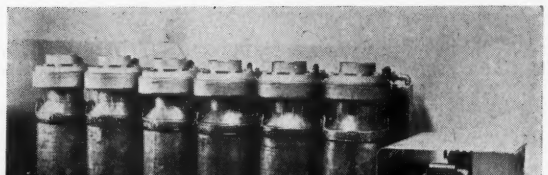
40. *Morphy-Richards FA/20 "Avon"*

41. *Revo "Reflexam" wall mounting reflector*

Manufacturer	Name or Model	Type	Total Loading	Elements	Finish	Price (excl. Tax)	Purchase Tax
PREMIER ELECTRIC HEATERS, Keeley Street, Birmingham, 9. *(continued)*	"Carlton" 5141, 5142 and 5143	Reflector imitation coal effect	2 kW	Two 1 kW rod	Silver (5141) Copper (5142) Gold (5143)	£12 0 0	£5 5 4
	"Screen Heater" 5420	Radiant heater	1 kW	One 1 kW fused on glass	White and cream	£12 8 1	£5 8 11
REEVES ELECTRICAL AND RADIO CO., LTD., Reelek Works, Baldock, Herts.	"Regal"	Portable reflector	750 W and 1 kW	One 750 W rod or one 1 kW rod	Silver grey, mushroom	£1 0 0	£0 8 9
	"Popular"	Portable reflector	750 W and 1½ kW	One or two 750 W rod	Silver grey, mushroom	£1 5 0 (750 W) £1 15 0 (1½ kW)	£0 11 0 (750 W) £0 15 4 (1½ kW)
	"Minor"	Portable reflector	1 kW	One 1 kW rod	Silver grey, mushroom	£1 12 0	£0 14 0
	"Handy"	Portable reflector	1 or 2 kW	One or two 1 kW rod	Silver grey, mushroom	£1 10 0 (1 kW) £2 5 0 (2 kW)	£0 13 2 (1 kW) £0 19 8 (2 kW)
	"Wizard"	Portable reflector	1 or 2 kW	One or two 1 kW rod	Silver grey, mushroom	£2 0 0 (1 kW) £2 10 0 (2 kW)	£0 17 7 (1 kW) £1 2 0 (2 kW)
	"Adjustable"	Portable reflector	1 or 2 kW	One or two 1 kW rod	Silver grey, mushroom	£2 5 0 (1 kW) £2 15 0 (2 kW)	£0 19 8 (1 kW) £1 4 2 (2 kW)
REVO ELECTRIC CO., LTD., Tipton, Staffs.	"Reflexam" F.14546 and F.14548	Wall mounting reflector	1 or 2 kW	One or two 1 kW rod	Artshade silver and chromium	£3 10 6 (F.14546) £4 15 6 (F.14548)	£1 11 0 (F.14546) £2 2 0 (F.14548)
	"Dolphin" F.13950 and F.13948	Portable firebar	1 or 2 kW	One or two 1 kW bar	Beige	£2 19 0 (F.13950) £4 7 6 (F.13948)	£1 5 11 (F.13950) £1 18 5 (F.13948)
	"Revo-Inset" F.13955 and F.13956	Inset with slabbing frame	1 or 2 kW	One or two 1 kW bar	Green, grey or beige	£2 8 6 (F.13955) £3 17 6 (F.13956)	£1 1 4 (F.13955) £1 14 0 (F.13956)
	"Revo-Inset" F.13957 and F.13958	Inset with slabbing frame	1 or 2 kW	One or two 1 kW rod	Green, grey or beige	£2 8 6 (F.13957) £3 17 6 (F.13958)	£1 1 4 (F.13957) £1 14 0 (F.13958)
	"Revo-Outset" F.14639 and F.14640	Direct wall mounting	1 or 2 kW	One or two 1 kW bar	Green, grey or beige	£2 19 0 (F.14639) £4 5 0 (F.14640)	£1 5 11 (F.14639) £1 17 3 (F.14640)
	"Revo-Outset" F.14549 and F.14550	Direct wall mounting	1 or 2 kW	One or two 1 kW rod	Green, grey or beige	£3 4 0 (F.14549) £4 10 0 (F.14550)	£1 8 1 (F.14549) £1 19 6 (F.14550)
	"Tubula" F.14542 and F.14544	Portable reflector	1 or 2 kW	One or two 1 kW rod	Artshade silver and chromium	£3 7 6 (F.14542) £4 10 0 (F.14544)	£1 9 7 (F.14542) £1 19 6 (F.14544)
SIMPLEX ELECTRIC CO., LTD., Creda Works, Blythe Bridge, Staffs.	"Cubana" CH.353	Portable reflector	1 kW	One 1 kW rod	Six two-tone colour schemes	£4 15 0	£2 1 8
	"Cubana" CH.352	Portable reflector	2 kW	Two 1 kW rod	Six two-tone colour schemes	£5 10 6	£2 8 6

THE ROYAL SHOW

DISPLAY OF ELECTRICAL EQUIPMENT



Right: British Thomson-Houston capacitor-start motor driving a fan of the refrigeration unit of an in-churn milk cooler.

ELECTRICAL equipment displayed at the Royal Show at Norwich this week includes many items useful for meeting farming economic needs. From an electrical point of view, the main exhibit is that organised by the British Electrical Development Association in conjunction with the Eastern Electricity Board. Occupying 18,000 sq ft in the Educational Area of the show ground, this "Electricity Farm" exhibit incorporates standard farm buildings which are used to house the electrical equipment of the various sections—dairy, pig and poultry husbandry and the farm workshop. Grain and hay crop conservation are also featured extensively, as well as electrical appliances for the handling and milling of grain and preparation of home grown animal foodstuffs.

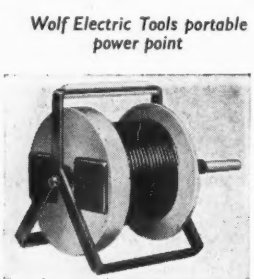
In the home and garden section electric cooking, water heating and washing equipment is displayed and a large horticultural section enables the uses of electric heating, soil warming for propagating and growing, and power for reducing cost and labour both for the commercial grower and the amateur gardener to be demonstrated. Other electrical aids to horticulture include mist propagation which, when used in conjunction with electric soil warming, ensures a much higher proportion of rooted cuttings than by any other method; electric lighting, heating and ventilation in greenhouses; potato chitting; and the bulk storage of fruit, vegetables and flowers in cold stores.

Of special interest in the poultry section is the new solar poultry house. It is designed to obtain the maximum benefits of the winter sun and incorporates thermostatically controlled pressurised ventilation, fully automatic feeding and watering, automatic cleaning by power operated scrapers and electric lighting.

There is also in this section a complete range of electrical equipment for incubation, breeding and processing. Pig keepers and farmers will be interested in the tier type brooders in which, with the aid of electricity, piglets can be reared from eight days to eight weeks old, saving both labour and space.

Agricultural plant and machinery incorporating electrical equipment such as motors, starters and control gear is prominently featured on the British Thomson-Houston Co.'s stand. Many of the working exhibits are supplied by a 12·5 kVA "Stavolt" engine driven alternator which has been developed by the company for providing a.c. supply to isolated communities and agricultural areas still awaiting connection to the public electricity supply. F.h.p. motors are shown driving butter churns, an incubator and a milk cooler, whilst larger motors are operating a grain dryer and a hammer mill. Also on view are "Pyrobar" electric heaters available for single- and three-phase a.c. supplies. Their chief use on the farm is for steam boilers and sterilisers, water heaters, food boilers, potato steamers, space heating, etc. Another application is in the form of "Pyroflector" infra-red heaters for rearing pigs and poultry.

Wolf Electric Tools portable power point



The importance of portable electric tools to modern farmers for the speedy and efficient maintenance of farm equipment and machinery is shown on the stand of Wolf Electric Tools, Ltd. Several additions to their range of models are introduced at the Show and prominent among these are the $\frac{3}{8}$in lightweight low speed drill (Type EJ3c) and the $\frac{1}{2}$in two-speed general duty drill (Type TS24c). This latter drill enables users to select either of two speeds at the touch of a button, a feature which, in effect, provides two drills in one. Also of interest on this stand is the recently introduced portable power point. The equipment consists basically of a freely rotating reel mounted on a steel carrying cradle with a winding handle. The reel is fitted with two 13 A flush sockets for the simultaneous operation of two tools or appliances, and can hold up to 100 yd of 3-core t.r.s. cable.

On the C.A.V. stand there is a representative selection of diesel fuel injection equipment and electrical equipment for agricultural tractors and for stationary and portable engines. Dynamos for battery charging and lighting are exhibited together with control boards and switchboards and special lamps for tractors for road use and night ploughing. The company's range of alkaline batteries for tractor duty is represented by a "BS12" unit. This type has the advantage that it can be left without attention for long periods, without deterioration, and its all-steel construction is ideal for withstanding vibration and rough going.

A full range of electric fencing equipment is exhibited by Wolseley Engineering, Ltd., who also have on view their "Power-Pak" sheep shearing machine.

The Simplex Dairy Equipment Co., Ltd., displays a wide range of agricultural and horticultural equipment formerly marketed by the G.E.C. and in the crop drying section the equipment includes a 1 ton/hr tray dryer and dryers for platform silo plants and multi-purpose types.

The new range of G.E.C. all-insulated infra-red animal warmers and dull-emitter warmers with unbreakable sheathed wire elements are also displayed. The latter are now available with pilot lamps to attract the chicks to the warmed zone. Greenhouse heaters, soil sterilisers and soil warming cables are also on view.

Automation in a Bakery

Pre-set electrical devices control and operate a new Co-operative bakery at Taunton which supplies 140,000 loaves a week for customers in Somerset and Devon, and is one of the most up-to-date bakeries of its kind in the country. The whole process of preparing dough for the ovens is operated from a large electric control panel. Electrical devices determine the humidity, heat and timing of the various processes. Automation also assists the packing of loaves into specially-designed electric delivery vans.

GENERATION AND DEVELOPMENT

Bradwell Nuclear Power Station

Essex County Planning Committee reports that drawings showing the elevations of the proposed nuclear power station at Bradwell-on-Sea and particulars of the materials and colouring intended for the external finish of the buildings have been received from the Central Electricity Authority. The Committee has informed the Authority that these meet with its approval.

The C.E.A. has intimated that it will be necessary to erect a switchgear station on the south side of the power station on a site of about 10 acres and the Committee is of opinion that proper landscaping treatment of this site is essential because the height of some of the structures will be 45ft. Miss Sylvia Crowe, a landscape architect, has been asked to advise the Committee on the matter.

Higher Charges in North Scotland

The North of Scotland Hydro-Electric Board is revising its tariffs, the new rates taking effect from the first meter reading after 30th June. The primary domestic "unit" charge of 5d remains unchanged, but the secondary price is increased from 1¼d to 1½d and the final rate from 0·8d to 1d. It is pointed out that the 0·8d figure hitherto obtaining has been the lowest rate in the country. As a partial offset to the increase the Board is reducing the number of rooms assessed in any one house to a maximum of eight.

The industrial tariff is also raised. Some consumers with a seasonal demand will, however, benefit by the introduction of a monthly basis of charge.

Commercial users (shops, hotels, offices, etc.) are henceforth to be charged on a block tariff basis, the present system of measurement of premises being entirely superseded. Some consumers will have reductions under the new block tariff, many will remain practically unchanged or have slight increases, and a number who have been paying less than the average rate will have large increases, but the Board is arranging to "cushion" the rise and to ensure that the charges will not be brought up to the average in one jump. Moreover, commercial consumers can benefit by new off-peak load arrangements for reduction in tariff charges.

Boards' Sales in May

The accompanying table analyses the sales of the Area Electricity Boards in England and Wales in May. The national figures show an increase over May, 1956, of 14·7 per cent, but when corrected for weather conditions and working days the increase is 5·9 per cent.

ELECTRICITY SENT OUT BY AREA BOARDS FOR THEIR CONSUMERS

Area Board	Totals for May (million kWh)			Twelve Months' Totals Ended 31st May (million kWh)		
	1956	1957	Inc. or Dec. %	1956	1957	Inc. or Dec. %
London	459·4	549·6	+19·6	6,768·2	6,943·1	+ 2·6
South Eastern	307·3	356·0	+15·8	4,233·1	4,454·2	+ 5·2
Southern	375·6	449·2	+19·6	5,079·2	5,505·4	+ 8·4
South Western	198·8	227·3	+14·3	2,598·6	2,778·9	+ 6·9
Eastern	493·3	584·6	+18·5	6,741·4	7,174·5	+ 6·4
East Midlands*	446·5	508·5	+13·9	5,806·1	6,130·0	+ 5·6
Midlands*	575·9	654·6	+13·7	7,590·5	7,793·3	+ 2·7
South Wales*	360·5	407·3	+13·0	4,419·9	4,611·5	+ 4·3
Merseyside and North Wales*	359·3	405·7	+12·9	4,541·0	4,805·7	+ 5·8
Yorkshire*	581·4	677·3	+16·5	7,555·1	7,993·2	+ 5·8
North Eastern*	348·3	400·6	+15·0	4,339·9	4,616·0	+ 6·4
North Western*	627·7	682·1	+ 8·7	8,037·1	8,294·3	+ 3·2
Total all Area Boards	5,134·0	5,902·8	+15·0	67,710·1	71,100·1	+ 5·0
Direct Supplies by Central Authority	175·5	189·0	+ 7·7	2,048·2	2,253·0	+10·0
Grand Total	5,309·5	6,091·8	+14·7	69,758·3	73,353·1	+ 5·2
Mainly Industrial Areas*	3,299·6	3,736·1	+13·2	42,289·6	44,244·0	+ 4·6
Mainly Non-Industrial Areas	1,834·4	2,166·7	+18·1	25,420·5	26,856·1	+ 5·6

* Those in which industrial consumers took over 50% of the total sales in the preceding financial year.

275 kV Underground Cables ?

Surrey Amenity Council has issued a memorandum on the proposal to erect a 275 kV supergrid line over Esher Common. Saying that opposition to the scheme is intense, it suggests that both from the point of view of research and of testing how amenities can be preserved, the case of Esher Common presents a good opportunity for an experiment in the use of underground cables.

OVERSEAS

Canadian Plant Capacity

Generating plant capacity in Canada at the end of 1956 amounted to 14,983 MW, an increase of 5·9 per cent over the preceding year's total of 14,147 MW, according to the Dominion Bureau of Statistics' report, "Electric Power Survey of Capability and Load." The survey forecasts that generating capacity in Canada will be 22,111 MW in 1960 and predicts that the proportion of thermal generation of the total will rise from 14·3 per cent at present to 19·5 per cent.

Previous surveys included only those major power-producing companies which sold part of their electrical output to the public. This year, however, all large power producers have been included and for purposes of comparison, figures back to 1950 have been amended to include these additional companies. This annual electric power survey, which was conducted in March last, covers 108 major power producers in Canada whose combined generation equals approximately 93 per cent of the total power produced in the country.

The firm power peak load in 1956 amounted to 13,917 MW, an increase of 11 per cent over the 1955 total of 12,536 MW. By 1960 the load is expected to rise to 19,040 MW. Firm electric power consumption in 1956 amounted to 82,679 million kWh, an increase of 11·7 per cent over the 1955 total of 74,032 million kWh, and the figure is expected to reach 114,365 million kWh in 1960.

Diesel-Electrics for Argentine Railways

It is stated by the *Fortnightly Review* of the Bank of London and South America that the Argentine State Railways have placed an order with Alco Products, Inc., of the United States, for 130 broad-gauge diesel-electric locomotives valued at $30·8 million. Of this amount 80 per cent is to be financed through the Export-Import Bank and the rest by a credit from the suppliers. These locomotives are said to be part of a plan for the purchase of 200 diesel-electric locomotives. Another order, also part of this plan, was for 20 locomotives costing $3 million for use on the narrow-gauge lines of the General Urquiza Railway. These are being supplied by the General Electric Locomotive Co., of Erie, Pennsylvania.

Swiss Nuclear Power Study

Switzerland's water power resources are likely to be fully harnessed in a few years' time and so to meet the expected surplus power demand she is turning to atomic power. Four of the leading Swiss electricity supply concerns have formed a company, "Suisatom," to build an experimental nuclear power station. The new company has a capital of about £500,000.

REPORTS and DIVIDENDS

Reliance-Clifton Cables & Industrial Products, Ltd.—At the annual general meeting on 25th June the chairman, Sir Robert Renwick, said that the results for the past year, measured in terms of both output and profit, were a considerable advance on any previous year in the company's history. They were fortunate in that the copper content of the telecommunications and other light current cables in which they specialised was relatively small and by operating with reduced stocks and with careful ordering they suffered no significant loss from the spectacular fall in the price of the metal.

Conditions since the beginning of the present year had been much less satisfactory. The large programmes for new generating stations, for the modernisation of the railways and coal mines and the large scale expansion of the telephone service all lay within the nationalised sector and thus a very large buying potential was dependent on the provision of credits by the Treasury. In these circumstances, conditions in the cable making industry were likely to remain sensitive to Government policy and priorities. Judged by the considerable reduction in Post Office demands, it seemed that the expansion of the telephone service was again being slowed down just when the industry had built up to the greatly increased production targets necessary to the programme. There had followed intensive competition and the decline in profit margins had spread to cables used elsewhere.

The traditional materials for the manufacture of telecommunications and other light current cables had for some time been giving way to plastics, synthetic rubbers and glass, nylon and terylene fibres and of late the change to these materials had accelerated. New materials necessitate new or adapted machines and new techniques and the whole pattern of production was undergoing a considerable change. They had recently obtained an important order for underground telephone distribution cable which had involved a major re-siting of plant and the many other problems associated with large-scale manufacture of a new product to exacting requirements. At the low prices which they considered necessary to gain entry into this highly competitive field they did not expect to much more than cover costs on this order, but the experience gained should provide a return in future years when this type of cable was likely to be used on a considerably increasing scale.

Amphenol (Great Britain), Ltd.—The Gas Purification & Chemical Co. is forming a new company with this name with a fully paid share capital of £100,000, half of which will be subscribed from its own cash resources by the Gas Purification & Chemical Co. and half by the Amphenol Electronics Corporation, Chicago. The

Our Stock Exchange Contributor is on holiday. His weekly notes will be resumed in our 19th July issue.

Price Changes in

Company or Board	Nom. Value	Middle price 1st July	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1957 Highest	1957 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	73⅜		3	3	4 1 9	80	73⅜
Brit. Elec. 1974/77	100	71⅛		3	3	4 4 0	78⅛	71⅛
Brit. Elec. 1976/79	100	74⅛	−1	3⅛	3⅛	4 14 0	81⅛	75⅛
Brit. Elec. 1974/79	100	85⅛	−1	4⅛	4⅛	4 19 6	92⅛	86⅛
Overseas Electric Supply								
Calcutta Elec.	£1	16/-		6†	6†	7 10 0†	19/-	16/-
East African Power	£1	19/-		7	7	7 7 3	21/-	19/-
Nigerian Elec.	£1	17/6		10	10*	11 8 6	18/6	17/3
Perak Hydro-Elec.	£1	18/-		10	10*	11 2 3	17/6	13/3
Electrical Shares								
Aberdare Cables	5/-	12/6		17½	17½	7 0 0	12/6	9/9
Aerialite	1/-	5/9		45	48	8 6 9	6/-	4/9
Allen, W. H.	£1	46/10½	+1½d	10	10	4 5 6	47/3	33/6
Anglo-Portuguese Tel.	£1	24/3		8	8	6 12 0	27/6	20/6
Aron Elec. Ord.	£1	58/9x.d.		15	15	5 2 3	60/-	53/6
Assd. Automation	10/-	24/3		5	7½	3 1 3	24/9	17/9
Assoc. Elec. Ord.	£1	63/9		15	15	4 14 0	73/-	62/6
Automatic Tel. & El.	£1	75/-		15	17	4 10 9	75/-	54/6
Babcock & Wilcox	£1	70/7½	−7½d	15	15	4 5 0	82/6	71/6
Bakelite	10/-	24/4½	−1½d	16	15	6 3 3	24/6	20/9
Baldwin, H. J.	2/-	3/10⅛	−1⅛d	20	20	10 6 0	5/-	3/10½
Berry's Electric	5/-	6/-		—	10‡	8 6 9	6/3	5/6
British Aluminium	£1	67/6		12	12	3 11 0	71/3	63/9
Brit. Elec. Traction: Def. Ord. "A"	5/-	24/6	+1/-	22½	25	5 2 0	24/6	17/-
B.I. Callender's	£1	53/3	+6d	12½	12½	4 14 0	55/-	48/3
B.I. Callender's 6% Pref.	£1	19/6		6	6	6 3 0	21/9	19/6
British Tabulating	£1	55/-		9	9	3 5 6	56/3	42/-
British Thermostat	5/-	25/-x.d.		25	25	5 0 0	27/6	25/-
British Vac. Cleaner	5/-	6/6		15	10	7 13 9	8/-	6/6
Brook Motors	10/-	36/3		25	15	6 18 0	36/3	30/-
Brush Group	5/-	7/9		10	Nil	—	8/-	4/6
Bulgin, A. F.	1/-	4/9	−3d	50	40*	8 8 6	5/6	4/6
Burco Dean	5/-	13/6	+1/-	22½	20	7 8 3	13/6	8/9
Cable & Wireless: Ord.	5/-	12/-		10	10	4 3 3	12/-	9/6
4% Loan	100	90½		4	4	4 8 6	92½	89
Chloride El. Storage "A"	£1	67/6		17½	17½	5 3 9	68/9	58/-
Clarke Chapman	£1	175/-		22½	27½	3 2 9	8⅞	6¼
Cole, E. K.	5/-	21/3	−2/3	17½	17½	4 2 3	23/6	16/6
Cossor, A. C.	5/-	5/9	−3d	15	Nil	Nil	7/3	5/9
Crabtree	10/-	26/-		20	20	7 13 9	26/-	23/3
Crompton Parkinson Ord.	5/-	16/9x.d.		16	16	4 15 6	17/9	14/6
De La Rue	5/-	22/9	+9d	30	35	7 14 0	22/9	16/3
Decca "A"	4/-	26/10½	−1½d	43⅜	43⅜	6 10 3	32/3	26/10½
Desoutter	5/-	33/6		30	32½	4 17 0	33/6	27/6
Dewhurst	2/-	7/6	+6d	30	16½*	4 6 9	7/6	5/9
Dictograph Tel.	2/-	5/9	−3d	20	20	—	6/3	5/9
Dubilier Condenser	1/-	7/3	+9d	25	30	4 2 9	7/3	5/6
Duport	5/-	19/-x.d.		23	25	6 11 6	19/6	17/6
E.M.I.	10/-	33/3	+1/6	15	15	4 10 3	33/3	23/9
Electrical Components	5/-	7/6		25	25	8 6 9*	7/6	6/6
Elec. Construction	£1	27/6		8½	8½	6 3 9	27/6	21/9
Elliott Bros.	5/-	32/2½	−1/3½	17½	20	3 2 3	33/6	26/3
Enfield Cable Ord.	£1	14/6	−6d	Nil	Nil	Nil	21/6	13/-
English Electric	£1	60/-		12½	14	4 13 3	60/-	47/6
English Electric 3½% Pref.	£1	12/6		3½	3½	6 0 0	14/3	13/-
Ericsson Tel.	5/-	49/-		20†	22†	2 4 9†	49/-	33/3
Ever Ready	5/-	40/3	+9d	35	37½	4 13 3	40/3	30/-
Falk Stadelmann	£1	39/8½	+2½d	17½	17½	8 16 6	40/6	35/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡Dividend indicated.

Amphenol Electronics Corporation is claimed to be one of the foremost electrical manufacturers in the world; its turnover last year amounted to $27 million. It produces a complete line of "electronic" components, including electrical connectors, high frequency connectors, cable and cable assemblies, plugs and sockets.

Veritys, Ltd.—In his statement on the accounts for 1956 the chairman (Mr. R. M. Mair) says that a report has been received from Mr. J. W. Seymour, B.Sc.(Eng.), on the technical efficiency of the company's activities which indicates the need for considerable overhaul. Mr. P. J. H. Coates, A.M.I.E.E., the newly appointed general manager, has made a preliminary examination of the position and is satisfied that, with a rapidly expanding market, the future has great possibilities.

Electrical Investments

Company or Board	Nom. Value	Middle price 1st July	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1957 Highest	1957 Lowest
Electrical Shares—continued								
G.E.C. Ord.	£1	56/3		12½	14	4 19 6	58/9	48/9
G.E.C. 6½ Pref.	£1	21/-	−6d	6½	6½	6 4 0	23/6	21/-
General Cables	5/-	13/9x.d.		30	30	10 18 3	13/9	11/6
Greenwood & Batley	£1	47/6		17½	17½	7 7 3	47/6	45/3
Hackbridge Holdings	5/-	19/9	−6d	25	30	7 12 0	21/9	19/9
Hackbridge & Hewittic	5/-	15/-		30	23*	7 13 3	16/-	13/6
Head Wrightson	£1	143/9x.d.		20	22½	3 2 6	146/3	112/6
Heatrae	2/-	4/6		15	15	6 13 3	4/6	4/-
Henley's	10/-	15/9		11½	11½	7 6 0	17/-	15/3
Holophane	5/-	26/3		30	30	5 14 3	26/3	17/-
Hoover	5/-	43/-	−1/-	50	50	5 16 3	44/-	24/9
I.C.I.	£1	44/6	+9d	10	10	4 10 0	46/6	37/9
Intl. Combustion	5/-	26/6		20	22½	4 5 0	30/-	20/-
Johnson & Phillips	£1	28/9		15	10	6 19 3	34/6	28/-
Lancashire Dynamo	£1	45/-		11	11	4 17 9	45/-	36/9
Laurence, Scott	5/-	17/3		15	15	4 7 0	19/9	13/9
Lister, R. A.	£1	32/6	−6d	10	10	6 3 0	33/9	26/9
London Elec. Wire	£1	47/6	−1/-	12½	12½	5 3 0	53/9	43/-
Lucas, J.	£1	34/3	+6d	7½	7½	4 7 6	36/6	30/6
Marconi Marine	£1	34/6	+9d	10	10	5 16 0	34/6	31/-
Marryat & Scott	2/-	13/-	+6d	30	30	4 12 3	13/-	8/-
Mather & Platt	£1	61/10½	−7½d	15	15	4 17 0	63/9	51/3
Metal Industries	£1	27/-		9	Nil	—	27/-	20/3
Midland Elec. Mfg.	£1	48/9		12½	12½	5 2 6	48/9	45/-
Morphy-Richards	4/-	18/6		50	50	4 6 6*	18/6	11/9
Murex	£1	79/4½	−1½d	20	20	5 1 0	79/6	65/-
Newman Ind.	2/-	2/9		10	10	7 5 6	2/9	2/1
Oldham & Son	1/-	2/4½	−1½d	20	17½*	7 7 6	2/6	2/3
Parnall (Yate)	5/-	7/3	−3d	12	12	8 5 6	8/9	5/9
Parsons, C. A.	£1	68/9		10	8½*	—	71/3	50/6
Plessey	10/-	86/-	−3d	27½	30	3 9 9	86/3	61/-
Pye "A" Deferred	5/-	19/4½	+1½d	12½	12½	3 4 6	20/-	15/9
Reyrolle	£1	101/3	−1/3	16½	17½	3 9 0	110/-	90/-
Rheostatic	4/-	9/-		18½	12½*	5 11 0	10/-	8/9
Richardsons Westgarth	5/-	19/-x.d.		16½	16½	4 7 9	20/-	17/-
Scottish Cables	4/-	17/3x.d.		27½	27½	6 7 6	19/3	15/-
Simon-Carves	5/-	35/-	+1/3	28½	20*	2 17 3	35/-	26/-
Smith (England), S.	4/-	15/-x.d.		17½	17½	4 13 3	15/9	13/-
Southern Areas	£1	17/6	−1/3	7½	7½	8 11 6	20/-	13/9
Strand Elec.	5/-	7/3		15	15	10 6 9	8/-	7/3
Sturtevant	5/-	23/-		15†	15†	3 5 3†	27/-	23/-
Sun Elec.	£1	43/9		20	25	11 8 6	43/9	43/9
Switchgear & Cowans	5/-	14/3		25	25	8 15 6	15/6	13/6
Taylor Tunnicliff	5/-	12/9		15	15	5 17 9	13/9	11/9
T.C.C.	10/-	40/-		25	25	6 5 0	40/-	35/-
T.C. & M.	£1	25/-		8½	8½	6 16 0	31/-	24/6
Telephone Mfg.	5/-	5/9	−6d	10	10	8 14 0	8/-	5/9
Telephone Rentals	5/-	11/9		12½	12½	5 6 6	12/6	10/3
Thompson (John)	5/-	32/3	−3d	25	25	3 17 6	37/-	29/3
Thorn Elec.	5/-	25/-	−9d	15	15	3 0 0	26/3	16/3
Thornycroft	£1	28/9		15	12½	8 14 0	37/6	28/9
Tube Investments	£1	66/3		22½	15*‡	4 10 6	68/9	58/3
Vactric	5/-	21/3		17½	25	5 17 9	23/9	12/9
Veritys	5/-	9/-		12½	12½	6 19 0	9/3	8/3
Walsall Conduits	4/-	15/-x.d.		20	20	5 6 9	15/-	11/-
Ward & Goldstone	5/-	53/1½	+7½d	30	35	3 6 0	56/3	36/9
Watford	2/-	6/6		25	25	7 13 9	6/9	6/3
Westinghouse	£1	40/-		18	9‡	4 10 0	41/3	36/-
West, Allen	5/-	17/6	−3d	15	15	4 5 9	17/9	12/3
Wolf Electric	5/-	11/6		20	20	4 7 0*	13/6	8/9

Richard Johnson & Nephew, Ltd.—In the course of his address at last week's annual meeting the chairman (Mr. M. A. T. Johnson) referred to the difficulties caused by the drastic fall in the price of copper last year. He said that this fact had naturally arrested the development of the substitution of aluminium and steel-cored aluminium conductors for copper, but the ground won by aluminium had undoubtedly been held. The extent of the demand was, however, apparently over-estimated by latecomers into the trade with the result that available supplies were greatly in excess of requirements.

British Thermostat Co., Ltd.—The chairman, Mr. J. E. Sherlock, says that the company has to face the task of expanding its business at home and abroad in the face of heavy taxation, rising costs and increasing foreign competition. New methods of manufacture are being introduced and considerable sums are being spent on development engineering to reduce the labour and material content of the company's products. Licensing arrangements have been made with an American company by which the Thermostat Co. will pursue the business of automation and instrumentation.

Johnson, Matthey & Co., Ltd., are raising their dividend from 9 to 10 per cent by a final distribution of 7 per cent. The group net profit for 1956-57 was £945,498, against £1,032,747 for the preceding year.

Engineering & Lighting Equipment Co., Ltd.—The group net profit for 1956-57 was £41,065 (against £50,864); the dividend is maintained at 20 per cent. The chairman, the Earl of Verulam, says that in terms of cash value the order book is 40 per cent greater than a year ago.

Venner, Ltd., are maintaining their dividend at 15 per cent, although the net profit for the past year declined from £46,202 to £35,761. General reserve receives £10,000 (against £25,000).

Motor & Electronics Corporation, Ltd.—From a net profit of £92,762 (against £83,836) a final dividend of 10 per cent is to be paid, again making 20 per cent for the year. The carry-forward is £210,419 (against £170,319).

Birkbys, Ltd.—The Automatic Telephone & Electric Co., Ltd., is to purchase the £150,000 of this com-

pany's ordinary capital by the issue of an equivalent amount of A.T.E. ordinary stock. Birkbys business will be carried on as before and arrangements have been made for continuity of management.

Richardsons, Westgarth & Co., Ltd.—The report for the year ended 31st March last shows a net profit of £655,828, as compared with £495,547 for 1955-56. A final dividend of 10 per cent makes the total distribution for the year 16⅔ per cent (as for 1955-56 on smaller capital). Profit retained in subsidiary companies is £87,378 (against £599) and £250,000 is transferred to a reserve for "atomic and other developments"; last year £200,000 was placed to general reserve. After transferring £50,000 to superannuation reserve, £37,422 (against £51,433) is carried forward. Reference is made in the report to the acquisition of the Parsons Marine Turbine Co.

The Hackbridge & Hewittic Electric Co., Ltd., reports a fall in group trading profits of £94,416 to £439,663 for the year ended 31st March last. The directors state that the lower profit is due to the inability to recover higher costs of manufacture. After allowing £196,800 for taxation, the net profit is £145,111 (against £217,529). General reserve receives £50,000 and the final dividend proposed is 15 per cent (against 17 per cent), making 20 per cent (23 per cent) for the year.

The Bagdad Light & Power Co., Ltd., states that negotiations with the Iraq Government have reached a stage at which an interim return of capital is justified. It therefore proposes to reduce the issued capital from £700,000 to £15,000 by repaying the whole of the preference stock at par with a premium of 2s per share and interest to the date of reduction, and to repay 19s per £1 of ordinary stock. The authorised capital will then be raised to £1,200,000, but there is no intention at present of issuing any of this capital. An interim ordinary dividend of 4 per cent free of tax has been declared in respect of 1957.

Ultra Electric (Holdings), Ltd.—The group profit for 1956-57 was £64,939, against £147,419 for 1955-56 (which included £44,573 profit on the sale of an investment in the Belgian company). The ordinary dividend is reduced from 15 to 7½ per cent.

Dewhurst & Partner, Ltd., are paying an interim dividend of 5 per cent (against 3¾ per cent). It is stated that the increase is to reduce the disparity between the interim and final dividends.

Meters, Ltd., have declared a final dividend of 3 per cent (against 4 per cent), reducing the year's distribution from 7 to 6 per cent.

Ruston & Hornsby, Ltd., report a fall in the group net profits from £779,024 for 1955-56 to £693,956 last year. The parent company's net profit increased from £596,095 to £612,656. The ordinary dividend is maintained at 9 per cent and £278,666 (against £248,723) is placed to general reserve.

Drake & Gorham, Ltd., report that the group net profits for 1956-57 amounted to £22,471, against £25,590, and credit is taken for reserves and provisions no longer required on the voluntary liquidation of a subsidiary. The ordinary dividend is maintained at 7½ per cent.

Foster, Yate & Thom, Ltd.—Holders of over 85 per cent of this company's capital have accepted the offer by Hick, Hargreaves & Co., Ltd., for their holdings. The offer is now unconditional and has been extended to 13th July.

New Companies

Waygood Lifts, Ltd.—Registered 12th April. Capital £100. Manufacturers and constructors of and dealers in lifts and lifting and escalator machinery, etc. Solicitors: Maxwell Batley & Co., 65, London Wall, E.C.2.

Klockner-Moeller England, Ltd.—Registered 3rd April. Capital £3,000. To carry on the business of agents for Klockner-Moeller G.m.b.H., of Bonn, Germany, and to carry on the business of distributors of electrical switchgear, etc. Regd. office: 2, Clement's Inn, W.C.2.

Liquidation

Etherington & Partners, Ltd., 19, Victoria Street, London, S.W.1, manufacturers and dealers in electrical equipment.—Last day for receiving proofs for dividend, 5th July. Liquidator, Mr. D. Morgan, 100, Park Street, London, W.1.

Bankruptcies

S. G. J. Moorby, formerly carrying on business at 23, Hallams Yard, Skipton, Yorks, as a radio and television engineer.—Public examination 30th July at the County Court, Manor Row, Bradford.

H. Rose, carrying on business at 158, Soho Road, Handsworth, Birmingham, under the style of Rose Electrical Service, electrical contractor and dealer.—Order for discharge sent to judgment being entered against him sent of judgment being entered against him for £750, part of the balance of debts not satisfied, and for £1 10s costs of judgment.

D. E. J. Daniels, lately carrying on business at 27, New Street, Worcester as an electrical engineer under the name of Douglas Electrical Repair Co.—Last day for receiving proofs for dividend 10th July. Trustee, Mr. W. H. Haigh, Somerset House, 37, Temple Street, Birmingham, Official Receiver.

C. A. Smith, lately carrying on business at 4, Gothic Arcade, Snow Hill, Birmingham, as the Birmingham Electrical Company, electrical contractors.—Trustee, Mr. R. K. Clark, Somerset House, 37, Temple Street, Birmingham, Official Receiver, released 17th June.

J. E. Stephens, electrical engineer, lately carrying on business as J. Edryd Stephens & Sons, at 10, Barn Road, Carmarthen.—Receiving order made 17th June on debtor's petition.

A. Steer, television and radio retailer and engineer, carrying on business at Bull Bridge, Upwell, Norfolk.—Public examination 12th September at the Court House, London Road, King's Lynn.

Mrs. Betty Faith Courtin, lately carrying on business alone and formerly with another as Allied Electronics, at 374, King's Road, Chelsea, London, S.W.10, radio dealer and repairer.—Application for discharge to be heard on 18th July at Bankruptcy Buildings, Carey Street, London, W.C.2.

H. Harding, electrical contractor, carrying on business at 15c, Mill Lane, Macclesfield, Ches.—Trustee, Mr. F. C. Ormrod, 12, Lonsdale Street, Stoke-on-Trent, Official Receiver, released 17th June.

A. H. Ward, residing and carrying on business at 1, Fleet Street, Keyham, Devonport, Plymouth, grocer and general dealer, and formerly carrying on business there as an electrical dealer under the style of Fleet Electrics.—Last day for receiving proofs for dividend 9th July. Trustee, Mr. R. A. D. Copper, 1st Floor, Royal Building, St. Andrew's Cross, Plymouth.

NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

Tuesday, 9th July

LONDON.—Connaught Rooms, W.C.2, 12.30 for 1 p.m. Electrical Industries Club. Ladies' luncheon. Speaker, Miss Audrey Cameron.

Wednesday, 10th July, to Saturday, 20th July

LONDON.—Olympia. British Plastics Exhibition.

Thursday, 11th July, to Wednesday, 17th July

MANCHESTER.—College of Science and Technology. Institution of Electronics (Northern Division). Annual exhibition and convention.

Friday, 12th July

LONDON.—At the Cable Makers' Association offices, High Holborn, W.C.1, 11.30 a.m. Electrical Industries Benevolent Association. Annual general meeting.

Saturday, 13th July, and Sunday, 14th July

COVENTRY.—Training College. Women's Engineering Society. Conference on "Careers for Girls in Engineering."

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 12th July:—

SUNBEAM SHAVEMASTER. No. 732,372. Class 8. Electric razors and parts.—Sunbeam Corporation, Chicago, U.S.A. Address for service, c/o Frank B. Dehn & Co., Kingsway House, 103, Kingsway, London, W.C.2.

Design incorporating MCMICHAEL RADIO. No. 755,276. Class 9. Radio, television, telephonic and telegraphic instruments and sound recording and reproducing instruments.—McMichael Radio, Ltd., Wexham Road, Slough, Bucks.

CANALIS. No. 760,325. Class 9. Electrical switchgear and electric current transmission systems, parts and fittings.—La Télémécanique Electrique, Nanterre (Seine), France. Address for service, c/o Abel & Imray, Quality House, Quality Court, Chancery Lane, London, W.C.2.

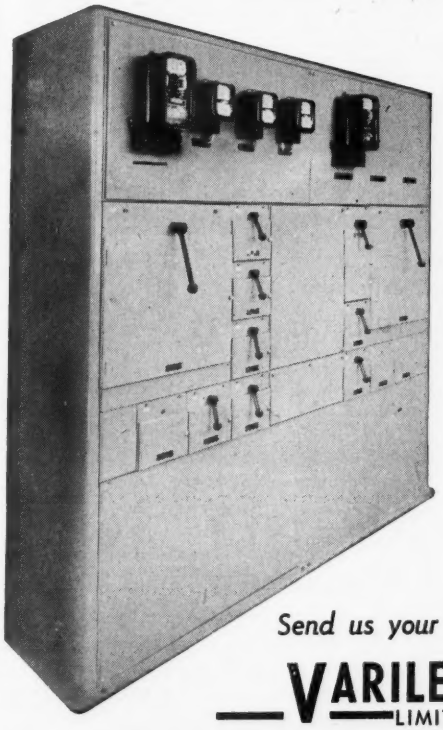
TUBARC. No. B762,622. Class 9. Electrodes for arc welding and arc welding apparatus (not machines) and parts.—Quasi-Arc, Ltd., Bridgewater House, Cleveland Row, St. James's, London, S.W.1.

LIPAC. No. 762,858. Class 9. Electrical and scientific apparatus and instruments.—Light & Power Accessories Co., Ltd., Wellesley Works, Wellesley Road, Wood Green, N.22.

OLYMPIO. No. 759,474. Class 11. Electrically and gas heated apparatus for making coffee.—Olympio Automatics, Ltd., 31, Carnaby Street, London, W.1.

SUPA-STOR. No. B762,593. Class 11. Electric space heating apparatus.—Dulrae, Ltd., 6, Broad Street Place, London, E.C.2.

Cubicle Switchboards



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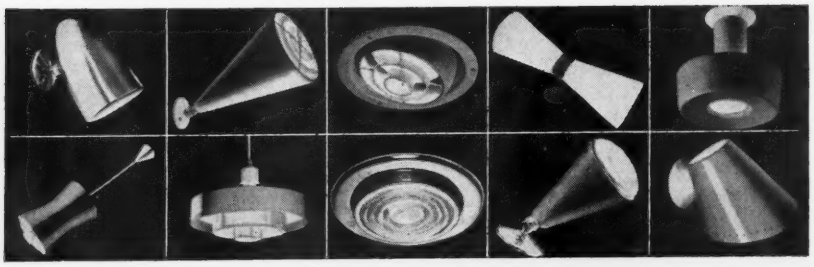
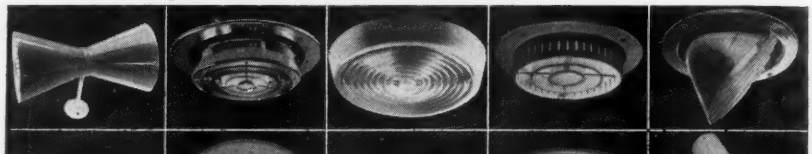


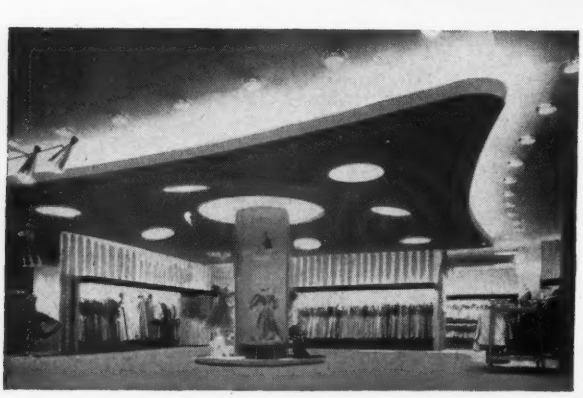
T.1/SM C.1 ES.2/N C.222 C.264

D.163 F.219 D.92 T.6 D.265



D.10 D.112 D.19 D.5/SR D.153

C.74 D.155 HV/SR D.110 T.2/SM



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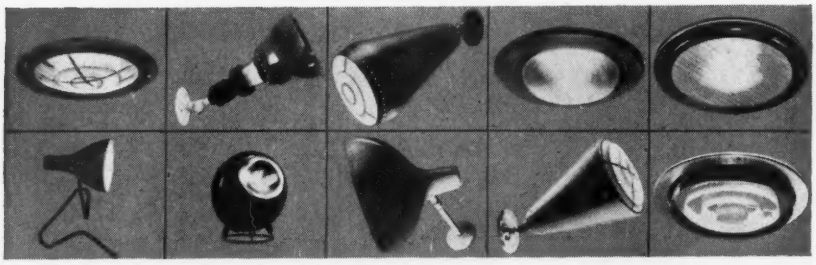
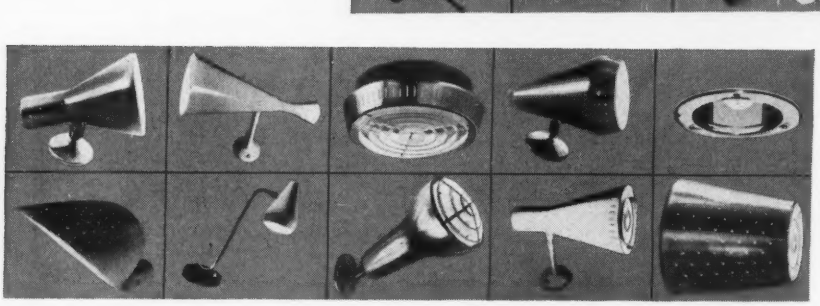


T.8/R D.114 HI/Swedish T.7/R P.9

D.28 ES.6 D.8 T.4 D.4/SR



T.3/SM D.89 D.56 T.5/SM M.1/R

D.7/P D.66 M.1 D.71 D.50

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NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) will be obtainable after 10th July from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1952

9537. Sparcatron, Ltd.—Electro-erosion apparatus. 15th July, 1953. (778713.)

23888. Barlow, H. E. M.—Measurement of power flow or energy transmitted in an electromagnetic field. 23rd July, 1953. (778446.)

32662. Bristol Aircraft, Ltd.—Processes for the manufacture of electrical surface heating devices. 23rd March, 1954. (778661.)

1953

22493. Standard Telephones & Cables, Ltd.—Travelling wave tubes. 14th August, 1953. (778846.)

28618. Philips Electrical Industries, Ltd. —Multiplex television transmission systems and transmitters and receivers for use in such systems. 16th October, 1953. (778406.)

30716. Electric & Musical Industries, Ltd.—Circuit arrangements embodying electron discharge devices. 28th October, 1954. (778717.)

1954

10080. "Diamond H" Switches, Ltd.—Electrical switches having means for reducing ingress of moisture. 21st March, 1955. (778625.)

19668. Hoover, Ltd.—Electric switches having two on and on off positions. 17th June, 1955. (778726.)

20161. English Electric Co., Ltd.—End connections for electrical conductors. 8th July, 1955. (778454.)

20372. Shardlow Electric Wires, Ltd., Jones, P., and Wrigley, D. V.—Electric plugs for plug and socket connections. 12th July, 1955. (778781.)

20554. Standard Telephones & Cables, Ltd.—Low noise electron velocity modulation tubes. 14th July, 1954. (778854.)

26353. Automatic Telephone & Electric Co., Ltd.—Counting circuits. 9th September, 1955. (778457.)

26504. Wipac Development, Ltd.—Electric supply system for road vehicles. 29th June, 1955. (778629.)

29538. Compagnie Telma.—Eddy current braking devices. 13th October, 1954. (778707.)

29956. Parsons & Marine Engineering Turbine Research & Development Association.—Cooling of bodies subject to a hot gas stream, for example turbine blades. 11th August, 1955. (778672.)

31906. Standard Telephones & Cables, Ltd.—Electric pulse coincidence circuits. 4th November, 1954. (778405.)

31907. Standard Telephones & Cables, Ltd. (International Standard Electric Corporation).—Radio beacon transmission systems. 4th November, 1954. (778674.)

31992. Limit Engineering Group, Ltd.—Binding device for use in making wire wound coils, more particularly, but not exclusively for making the conductor coils for dynamo-electric machines. 4th November, 1955. (778414.)

34346. Mullard Radio Valve Co., Ltd.—Magnetrons. 22nd November, 1955. (778677.)

36297. Westinghouse Electric International Co.—Electric generator systems. 15th December, 1954. (778419.)

37260. British Thomson-Houston Co., Ltd.—Dynamo-electric machines. 30th November, 1955. (Addition to 731581.) (778632.)

1955

2863. Unionmelt Soc. Anon. Française.—Electrode wire coils for multiple consumable electrode arc welding. 31st January, 1955. (778424.)

7613. Pruitt, H. M.—Electric motors for domestic purposes. 14th March, 1956. (778634.)

9114. Compagnie Telma.—Eddy current apparatus and especially braking apparatus. 29th March, 1955. (778708.)

9248. Westinghouse Electric International Co.—Electric control circuits, incorporating semi-conductor devices. 30th March, 1955. (778635.)

10418. Revo Electric Co., Ltd.—Oven, refrigerator and like doors. 16th March, 1956. (778878.)

10472. Philips Electrical Industries, Ltd. —Grids for use in electric-discharge tubes. 12th April, 1955. (778879.)

10636. Sperry Corporation.—Transistor amplifier. 13th April, 1955. (778460.)

12007. Kollsman Instrument Corporation. —Arrangements for induction motors or generators. 26th April, 1955. (778461.)

12591. United Kingdom Atomic Energy Authority.—Fuel elements for nuclear reactors. 27th April, 1956. (778881.)

13508. Hilfiker, H., and Schreiber, A.—Remote controlled electric switches for mounting on distribution boards. 10th May, 1955. (778789.)

13917. Standard Telephones & Cables, Ltd.—Cold cathode electric discharge tubes. 13th May, 1955. (Addition to 734345.) (778433.)

14681. Nippon Telegraph & Telephone Public Corporation.—Non-linear circuits. 20th May, 1955. (778883.)

14946. Philips Electrical Industries, Ltd. —Ion sources. 24th May, 1955. (778434.)

17889. Hobby & Brown Electronic Corporation.—Automatic emergency electrical systems. 21st June, 1955. (778790.)

20499. Hing, L. H.—Electric torches and like lamps. 15th July, 1955. (778438.)

23181. Western Electric Co., Inc.—Switching circuits employing transistors. 11th August, 1955. (778890.)

23287. Standard Telephones & Cables, Ltd.—Method of making magnetic ferrites. 12th August, 1955. (778640.)

23333. Sangamo Weston, Ltd.—Permanent magnet structures and moving coil instruments incorporating such structures. 12th August, 1955. (778891.)

27911. Dayonnet, F. J. D., and Pinet, A. E.—Pulse modulation multiplex communication systems. 30th September, 1955. (778895.)

28385. Philips Electrical Industries, Ltd. —Automatic gain control circuit arrangements. 5th October, 1955. (778897.)

30117. General Electric Co.—Cathode structures for electrical discharge devices. 21st October, 1955. (778796.)

32069. Hoover, Ltd.—Suction cleaners. 9th November, 1955. (778482.)

32445. Compagnie Telma.—Eddy current braking devices. 13th October, 1954. (Divided out of 778707.) (778709.)

32527. Painton & Co., Ltd., and Benham, C. M.—Electrical resistors. 14th November, 1955. (Addition to 626128.) (778898.)

32648. Compagnie Générale de Télégraphie sans Fil.—Permanent magnets. 15th November, 1955. (778641.)

32866. Hazeltine Corporation.—Luminance signal component conversion system. 16th November, 1955. (Addition to 772791.) (778752.)

34792. Philips Electrical Industries, Ltd. —Television circuit arrangements. 5th December, 1955. (778469.)

36133. York Shipley, Ltd.—Compression refrigerating systems. 16th December, 1955. (778483.)

1956

476. Jones & Co. (Engineers), Ltd., W., and Merrill, F. W.—Rotors for dynamo-electric machines. 5th January, 1956. (778505.)

690. Philips Electrical Industries, Ltd.—Magnet systems. 9th January, 1956. (778585.)

875. Allis-Chalmers Manufacturing Co.—Stator cores of dynamo-electric machines. 10th January, 1956. (778512.)

1242. Philips Electrical Industries, Ltd.—Stereophonic transmission systems. 13th January, 1956. (778588.)

1991. Standard Telephones & Cables, Ltd.—Television receivers. 20th January, 1956. (778530.)

2188. General Electric Co.—Methods of bonding, utilising vitreous bonding materials. 23rd January, 1956. (778532.)

2260. Allmanna Svenska Elektriska Aktiebolaget.—Electrical system for reel motors in strip rolling mills and the like. 24th January, 1956. (778763.)

2316. Babcock & Wilcox, Ltd.—Tubulous vapour generating and vapour heating units. 24th January, 1956. (778534.)

2499. Akt.-Ges. Brown, Boveri & Cie.—Commutatorless convertor motor with supplementary winding. 25th January, 1956. (778540.)

2748. Felici, N.—Electrostatic machines. 27th January, 1956. (778542.)

2816. Mullard Radio Valve Co., Ltd.—D.c. convertors. 27th January, 1956. (778543.)

3081. General Electric Co.—Hysteresis motors. 31st January, 1956. (778562.)

3998. Siemens-Schuckertwerke Akt.-Ges. —Apparatus for regulating the excitation of synchronous machines. 8th February, 1956. (778596.)

4001. Compagnie Générale d'Electricité. —Electric cables. 8th February, 1956. (778491.)

4450. Huet, A.—Apparatus for manufacturing tubular elements. 13th February, 1956. (778492.)

4814. Square D Co.—Wiring ducts for the reception of electric conductors. 16th February, 1956. (778551.)

5158. Mullard Radio Valve Co., Ltd.—Methods of soldering fine wire. 20th February, 1956. (778566.)

5505. Soc. Générale de Constructions Electriques et Mécaniques, Alsthom.—Core construction for electric induction apparatus. 22nd February, 1956. (778602.)

7447. Standard Telephones & Cables, Ltd.—Electric power cables. 9th March, 1956. (778608.)

7654. Backhaus, H.—Boiler feedwater de-aeration systems. 12th March, 1956. (778571.)

7725. Steatit-Magnesia Akt.-Ges.—Lead-in arrangements for electrical conductors. 12th March, 1956. (778573.)

9499. Pirelli Soc. per Azioni.—Joints or terminals for single-core high voltage cables. 27th March, 1956. (Addition to 752376.) (778578.) 9500. Sealing ends for high voltage cables. 27th March, 1956. (778579.)

11004. Westinghouse Electric International Co.—Transformer tap changers. 11th April, 1956. (778620.)

11509. General Electric Co.—High voltage electrical insulating bushing assemblies. 16th April, 1956. (778560.)

1957

1113. Babcock & Wilcox, Ltd.—Tubulous vapour generating and superheating units. 4th August, 1955. (Divided out of 778711.) (778712.)

2326. Woods of Colchester, Ltd.—Frequency multiplication of alternating currents. 14th July, 1954. (Divided out of 778187.) (778188.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Australia.—Electricity Commission of New South Wales, Sydney. 12th August. Two 120 MVA, 13·8/132 kV three-phase oil immersed transformers for outdoor service. (E.S.B. 14938/57. Ten/26475.)* 19th August. Remote supervisory and control apparatus for electrical substations. (E.S.B. 15655/57. Ten/26545.)*

Brisbane City Council. 26th July. Outdoor termination boxes for 33 kV cable. (E.S.B. 15485/57. Ten/26544.)*

Director Posts and Telegraphs, G.P.O., Melbourne. 1st August. Carrier loading coils. (E.S.B. 15324/57. Ten/26536.)* 8th August. Resistors and reactances. (E.S.B. 15323/57. Ten/26523.)*

Electricity Trust of South Australia. 27th August. Boiler flue dust collecting plant for Port Augusta power station. (See this issue.)

State Electricity Commission of Western Australia, Perth. 12th September. Power station steam generating units, pulverised coal firing plant, mechanical draft plant, dust extraction plant, oil firing equipment, automatic combustion plant, instruments and control panels, etc. (E.S.B. 15064/57. Ten/26543.)*

Belgium.—Président de la Commission d'Assistance Publique de Bruxelles. 12th July. 400 kW diesel alternator. (E.S.B. 15699/57. Ten/26599.)*

Canada.—Saskatchewan Power Corporation. 24th July. Power station instruments and automatic controls. (E.S.B. 15602/57. Ten/26561.)*

Ceylon.—Department of Agriculture. 30th July. Electrically operated tools for use on 230 V, 50 c/s single-phase and 400 V, 50 c/s three-phase supplies. (E.S.B. 15416/57. Ten/26518.)*

Chile.—Oficina del Director de Obras Sanitarias, Ministerio de Obras Publicas, Santiago. 23rd July. Pumps and associated electrical equipment. (E.S.B. 15665/57. Ten/26563.)*

Formosa.—Central Trust of China, Taipei. 20th July. Mine cable, motors and transformers. (E.S.B. 15208/57.I.C.A. Ten/26479.)*

France.—Headquarters Command, Purchasing and Contracting Section, S.H.A.P.E., Paris. 11th July. 60 kW generator. (E.S.B. 15402/57. Ten/26524.)*

Germany.—Bundenminister für das Post und Fernmeldewesen, Bonn. 24th August. Carrier frequency long distance cable. Firms wishing to tender must apply by 12th July. (E.S.B. 15877/57. Ten/26593.)*

Greece. — State Procurements Service, Athens. 16th July. Ice chests and refrigerators. (E.S.B. 15863/57. Ten/26641.)* Radio apparatus. (E.S.B. 14921/57. Ten/26474.)* 23rd July. Metal braided lead-sheathed M.K. type cables. (E.S.B. 15736/57. Ten/26579.)*

India.—Director General of Supplies and Disposals, New Delhi. 4th September. Power insulators and accessories, tools. (E.S.B. 15184/57. Ten/26484.)* 11th September. 52,000 b.h.p. vertical shaft Kaplan turbine, 41,666 kVA generator, 42,000 kVA, 11 kV/132 kV three-phase transformer, 2,500 MVA oil circuit-breaker and other equipment. (E.S.B. 15183/57. Ten/26486.)*

Stores Purchase Committee, Government of Mysore. 15th July. Transformers, switchgear and accessories. (E.S.B. 15403/57. Ten/26519.)*

Damodar Valley Corporation, Calcutta. 29th July. A.c.s.r. conductors, accessories, etc. (E.S.B. 15697/57. Ten/26578.)*

Iran.—Shiraz Electricity Authority. 17th July. H.v. cable. (E.S.B. 15666/57. Ten/26591.)*

Imperial Arsenal, Tehran. 25th July. Rolling plant and annealing furnace. (E.S.B. 15313/57. Ten/26520.)*

Italy.—Ministero della Difesa Aeronautica, Rome. 20th August. Supply of cables, approximate value £200,000. Firms wishing to tender must apply by 10th July. (E.S.B. 15714/57. Ten/26541.)*

Manchester.—City Council. 17th July. Electric lamps. (See this issue.) 27th July. Electrical installation in Burnage Grammar School extensions. (See this issue.)

New Zealand.—Dunedin City Corporation. 12th July. Electricity meters and demand indicators. (E.S.B. 15534/57. Ten/26557.)*

Nutt Valley Electric Power and Gas Board. 23rd August. Peak load control equipment. (E.S.B. 15445/57. Ten/26594.)*

State Hydro-Electric Department, Wellington. 24th September. Six 33 kV, 500 MVA three-phase circuit-breakers and accessories. (E.S.B. 15018/57. Ten/26465.)*

New Zealand Post Office, Wellington. 30th July. Valve voltmeters and audio output meters. (E.S.B. 15514/57. Ten/26550.)*

Poulton-le-Fylde.—U.D.C. 24th August. Pumping plant at Skippol pumping station, consisting of three axial flow and five vertical spindle centrifugal pumps, together with electrical equipment, etc. Surveyor, Town Hall.

Rhodesia and Nyasaland.—Ministry of Posts. 19th July. Underground telephone distribution cable. (E.S.B. 15086/57. Ten/26505.)*

Federal Tender Board. 26th July. Electric motors, generators and control equipment. (E.S.B. 15676/57. Ten/26609.)*

City of Bulawayo. 17th July. Overhead line and service materials. (E.S.B. 15014/57. Ten/26414.)* Copper conductors, cables, cable end and joint boxes. (E.S.B. 15013/57. Ten/26415.)*

Ripon and Pateley Bridge.—R.D.C. 26th July. Duplicate pumps, with motors, control gear, etc., for Sawley water supply scheme. John H. Haiste and Partners, consulting engineers, Belmont House, 20, Wood Lane, Headingley, Leeds, 6.

South Africa.—Stores Department, South African Railways. 17th July. Mobile canteen. (E.S.B. 15033/57. Ten/26416.)* 24th July. Fluorescent lighting fittings. (E.S.B. 15389/57. Ten/26511.)*

Union Tender and Supplies Board, Pretoria. 18th July. Refrigeration apparatus. (E.S.B. 15342/57. Ten/26556.)* Generator and regulator testers. (E.S.B. 16070/57. Ten/26646.)*

Spain.—General Electrica Espanola, S.A., Madrid. 15th July. Magnetic plate, electrical control and laboratory apparatus, etc. (E.S.B. 15553/57.I.C.A. Ten/26564.)*

Willesden.—Borough Council. 22nd July. Street lighting, Harrow Road, etc. (See this issue.)

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

ORDERS PLACED

Bexley.—Corporation. Electrical installations in 428 houses, Welling estate (£17,210). —London Electricity Board.

Boldon (Durham).—U.D.C. Extensions to domestic lighting installations in older council houses (£1,040).—J. Calvert (Electrical).

Edinburgh.—Heart of Midlothian Football Club. Erection of floodlighting at Tynecastle Park (£14,500).—Miller & Stables.

Hartlepool.—Corporation. Installation of sodium vapour lighting in Winterbottom Avenue, Hartlepool (£1,100). — Concrete Utilities.

London. — South East Metropolitan Regional Hospital Board. Recommended. Re-wiring electric lighting and power installations at Children's Heart Hospital, West Wickham (£2,823).—Brakefields.

Northampton.—Oxford Regional Hospital Board. Electrical services in new outpatients' department, casualty department, and ward at the Northampton General Hospital (£16,810) and in blocks "A" and "B" of the St. Crispin Hospital, Duston (£7,246).—Barnett & Soanes.

Northumberland.—Education Committee. Rewiring Ashington North Junior School (£1,497).—J. & A. Oliver.

Stockport.—Corporation. Electrical installations in 132 dwellings (£5,523).—T. A. Nixon.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Brighton.—Group laundry at General Hospital; Stanley Roth, Tetley & Felce, architects, 60, Ship Street.

Instruments factory, Hollingbury; John W. Ridge, Ltd., 42, Portland Street, Brighton, 1.

Bristol.—Shops and offices, Merchant Street and Fairfax Street; Alec F. French & Partners, architects, Halifax House.

Cardiff.—Works extensions; Minnesota Mining & Manufacturing Co., Ltd., Gorseinon.

Extensions, Reardon Smith Nautical College; Gee, Walker & Slater, Ltd., builders, Coity Road, Bridgend.

Chigwell.—Dwellings (88); Tooley & Foster, architects, Midland Bank Chambers, Buckhurst Hill.

Clare.—Houses (81) for R.D.C.; clerk, 3, Wratting Road, Haverhill, Suffolk.

Cleethorpes. — War Memorial Hall (£64,000); borough architect.

Crawley.—Dwellings (87), Ifield; H. H. Clark, architect, 7, Victoria Street, London, S.W.1.

Croydon.—Showrooms and offices, George Street and Park Lane; Taylor Woodrow Construction, Ltd., Adrienne Avenue, Southall.

Factory extension; Stewarts Plastics, Ltd., Waddon.

Cumberland.—Secondary schools at Workington and Maryport; J. H. Haughan, architect, Portland Square, Carlisle.

Ennerdale. — Houses (140), Thornhill; surveyor, Council Chambers, Cleator.

Essex.—County secondary schools at Ingatestone (£90,000) and Braintree (£145,000); H. Conolly, county architect, County Hall, Chelmsford.

Eston.—Houses (201), Teesville East estate; N. C. Harrison, U.D.C. surveyor, 246, Normanby Road, South Bank.

Eton.—County primary school at Dorney; Bucks county architect, County Offices, Walton Street, Aylesbury.

Exeter.—Dwellings (70), St. Thomas; Lucas, Roberts & Brown, architects, Barnfield Hill.

Falkirk.—Cinema and ballroom, High Street/Callendar Riggs site (£350,000); Rank Organisation, Ltd., Belgrave Road, London, S.W.1.

Great Yarmouth. — Additional factory premises for Hartman Fibre Co., Ltd., South Denes; Bush Builders, Ltd., Aylsham Road, Norwich.

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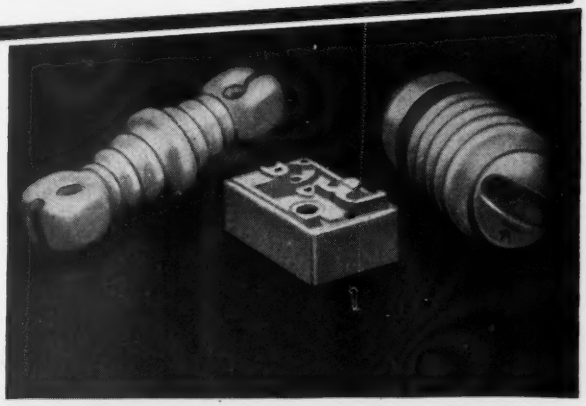

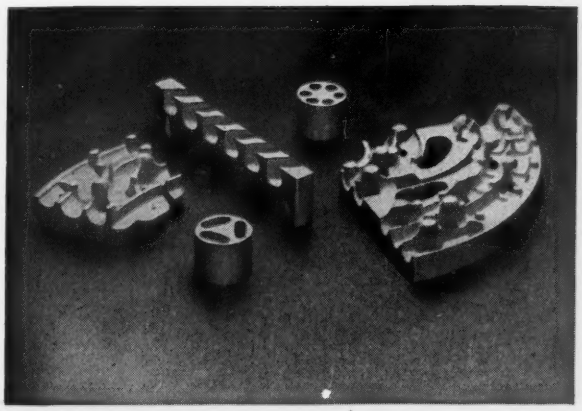

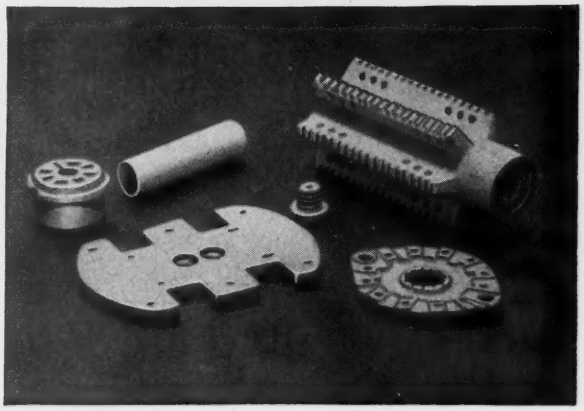

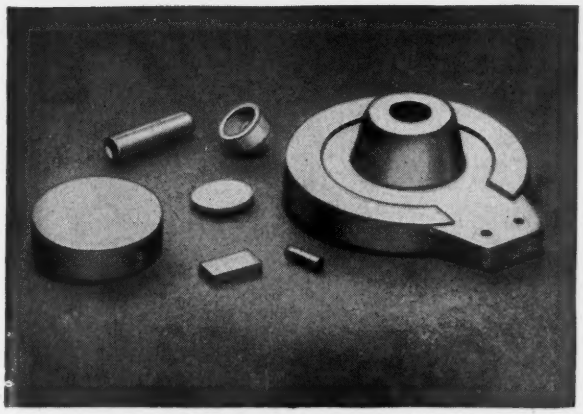

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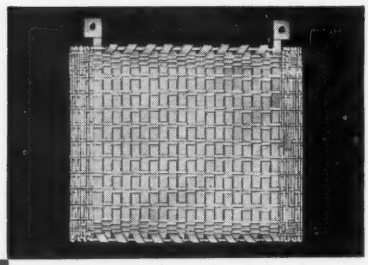

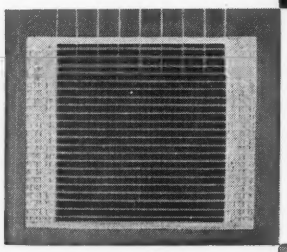

- *Vibration and shock-proof*
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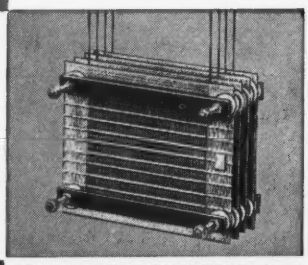
- *Suitable for all D.C. and most A.C. applications*
- *Many standard units for quick delivery—also made to specification*

These light, flat resistors are textile weavings impregnated to give rigidity – the warp threads being of asbestos, and the weft of resistance wire (for nets) or resistance tape (for grids). They require only the simplest of supports for assembly into banks, and will give trouble free service at working temperatures up to 300°C.



Our engineers will gladly help you with any problems or requirements concerning resistors or heaters.

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London Office: Burwood House, Caxton Street, S.W.1. Tel: ABBey 7766.

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Measures 8½ x 4½ x 5
Price £25.16.0 Net

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ASR-1150 is insensitive to changes of mains frequency, works equally well from 0% to 100% load (maximum loading 1150VA), and has sinusoidal output waveform. The degree of Stabilisation it provides is ample for very many purposes.

Complete details of our entire range of Regulators, of which there are many patterns ranging from 200 VA to about 30 kVA (single-phase) are given in our new 32-page Automatic Voltage Regulator Catalogue (5-574) which will be sent at once against your written request.

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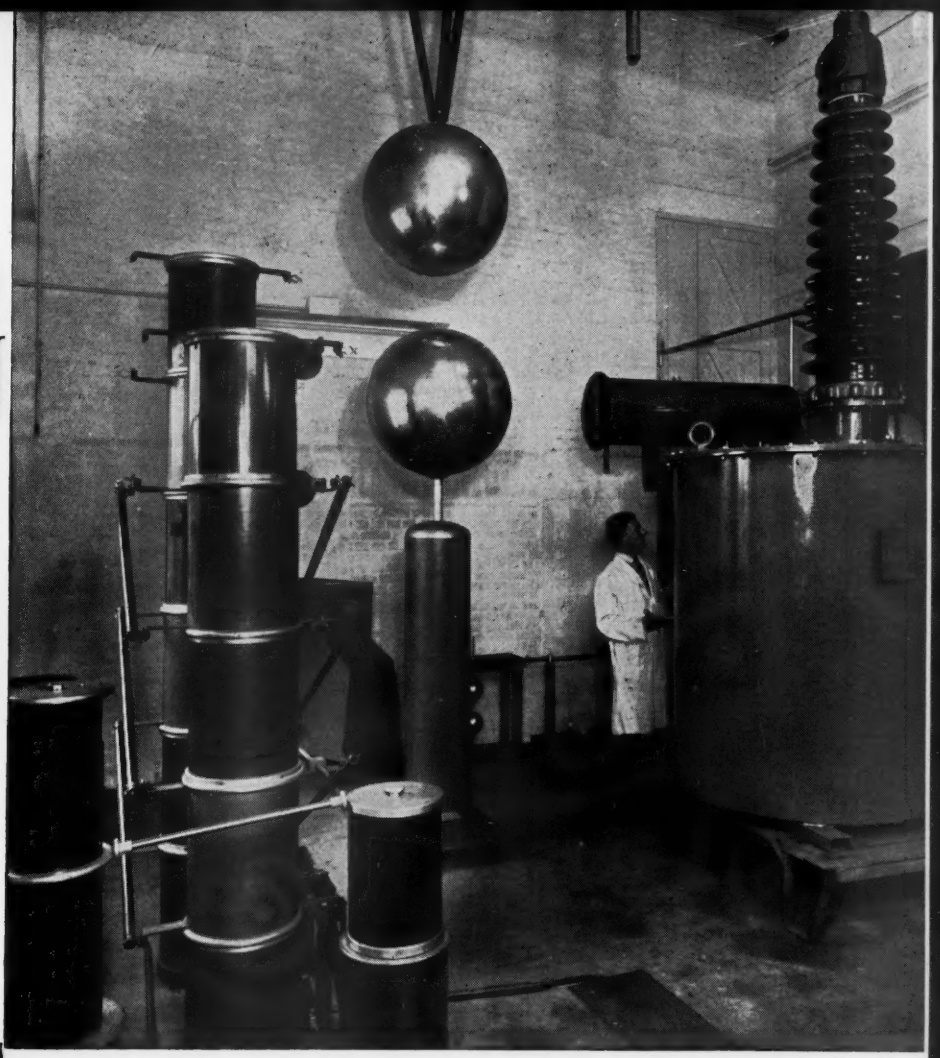
TESTING at 250,000 volts



To every Transformer Problem *there is a* Gresham Answer

Designed and manufactured for the purpose of testing at 250,000 volts, this transformer is shown undergoing final inspection in a corner of the Gresham H.V. Laboratory.

Stringent testing and inspection at every stage of manufacture have helped to gain for Gresham Transformers an unrivalled reputation for reliability – borne out by the records of the Electricity Supply Industry.

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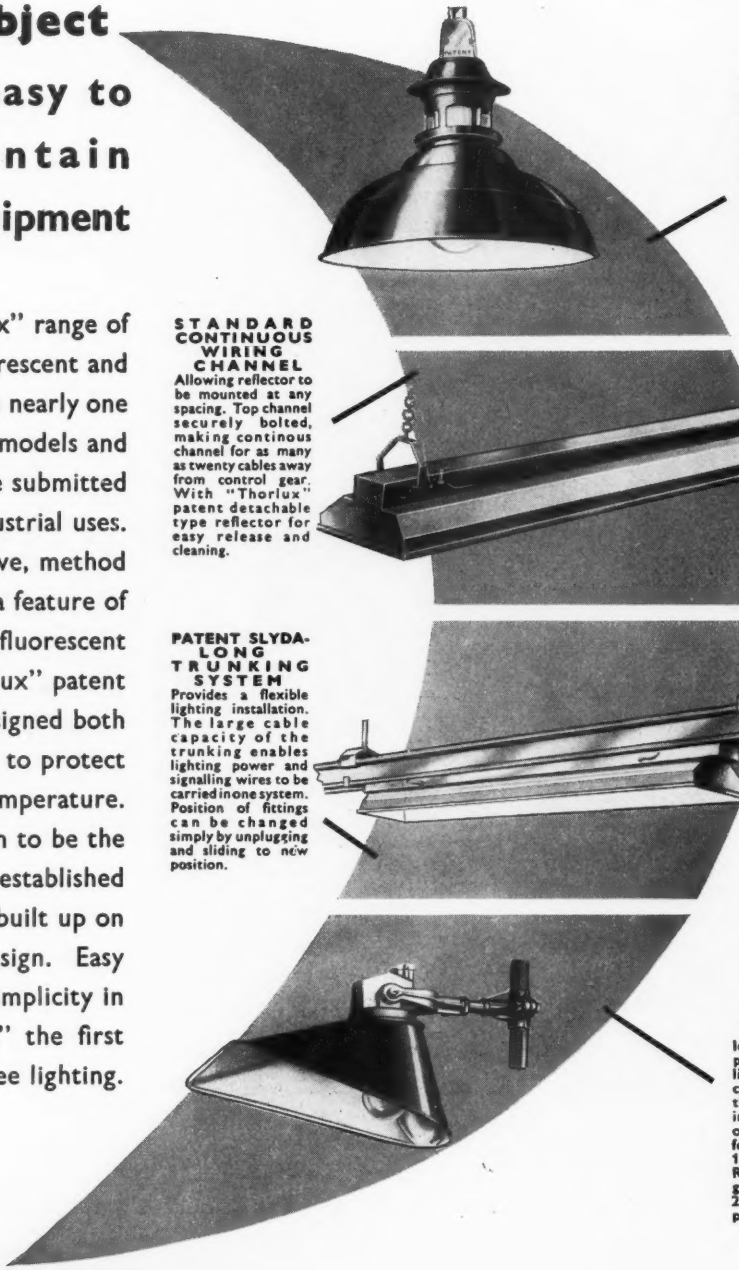
throwing light on the subject – of easy to maintain lighting equipment

The "Thorlux" range of reflectors for fluorescent and tungsten lamps covers nearly one hundred standard models and special designs can be submitted for all industrial uses. The simple, yet effective, method of detaching is a feature of both tungsten and fluorescent fittings. The "Thorlux" patent wiring box is designed both for easy wiring and to protect the cables from high temperature. We do not claim to be the cheapest but to have established a reputation built up on quality and design. Easy maintenance and simplicity in use make "Thorlux" the first name for trouble free lighting.



"VENTILUX" REFLECTOR
The reflectors have openings in the side of the funnel allowing the heat to rise through the reflectors carrying away fumes and dust. The heat baffle diverts the hot air away from the connector box. ¾" conduit entry.

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Allowing reflector to be mounted at any spacing. Top channel securely bolted, making continous channel for as many as twenty cables away from control gear. With "Thorlux" patent detachable type reflector for easy release and cleaning.

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Ideal for garages, car parks and flood lighting. The lamp can be adjusted to the vertical position irrespective of angle of reflector. With focussing for 300 to 1500 watt lamps. Reflector vitreous green and white, 27" x 24" weather proof.

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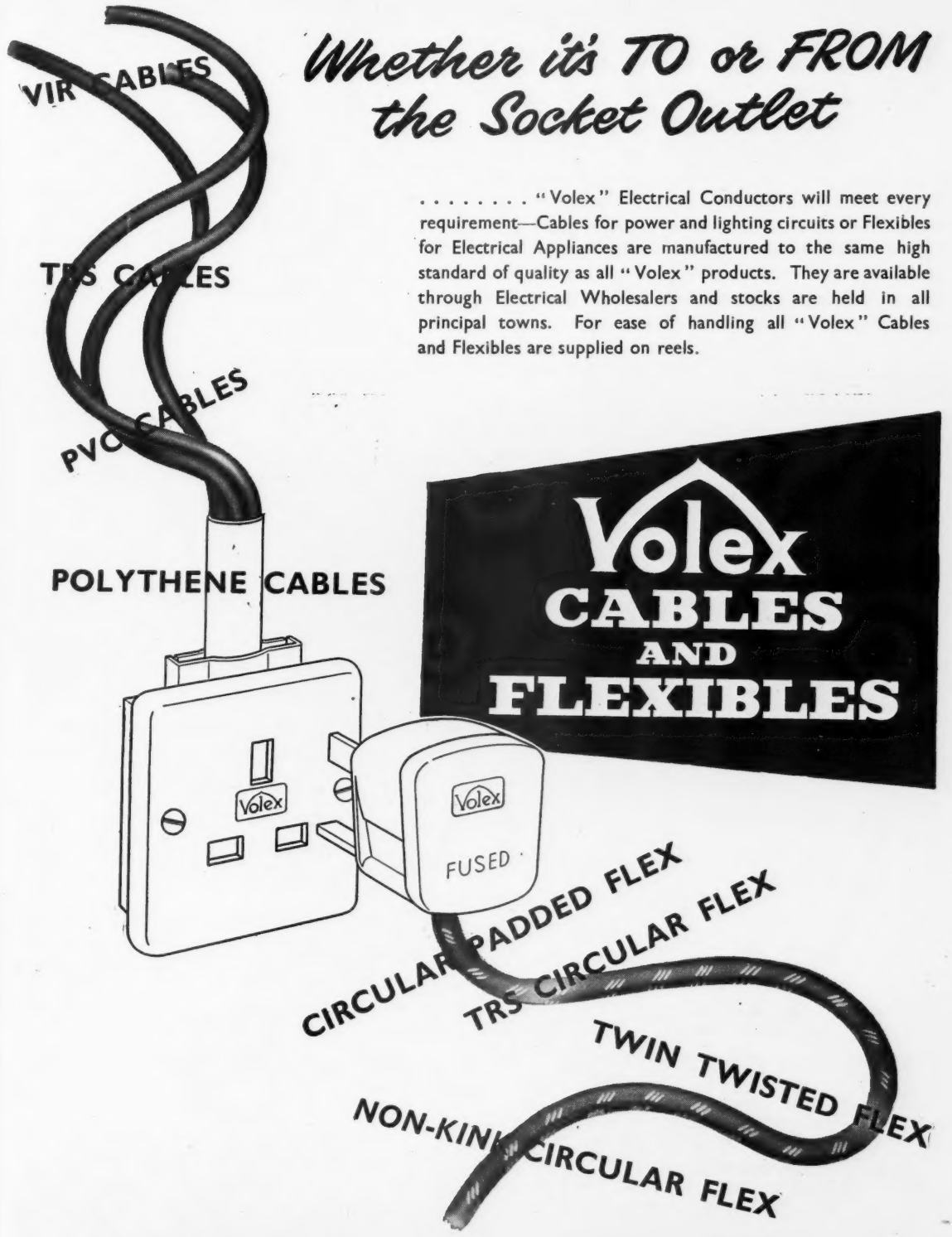
. . . . . "Volex" Electrical Conductors will meet every requirement—Cables for power and lighting circuits or Flexibles for Electrical Appliances are manufactured to the same high standard of quality as all "Volex" products. They are available through Electrical Wholesalers and stocks are held in all principal towns. For ease of handling all "Volex" Cables and Flexibles are supplied on reels.



Volex VOLEX ELECTRICAL PRODUCTS LTD
SALFORD 6

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Combined Resources

The combination of General and Britannic — with pooled technical knowledge, research facilities and manufacturing plant — is of immense benefit to both organisations . . . and equally so to their customers! An even wider range of cables of greater fitness-for-purpose can be offered, a more comprehensive and co-operative service can be given to users in any part of the world, and fullest resources maintained to keep abreast of ever-advancing developments and techniques.

In the Leatherhead factory of General is produced a wide variety of cables for almost all ordinary purposes — VIR, PVC or polythene insulated, rubber or lead sheathed, asbestos braided and armoured. In addition, cables of many types are made for particular projects and to special requirements.

The Britannic factory at Iver manufactures EHT and LT paper insulated mains cables, varnished cambric, insulated cables for the electrical distribution, mining, ship building, transport and electrical contracting industries, as well as made to specifications for particular purposes.

All cables manufactured by General and Britannic conform to the relevant requirements of the British Standards Institution.

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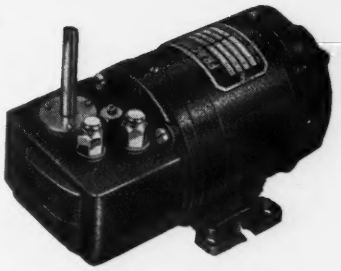

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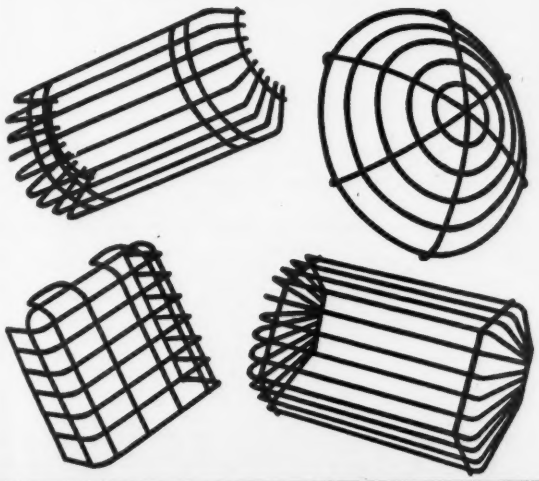

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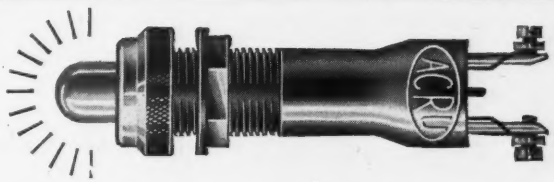

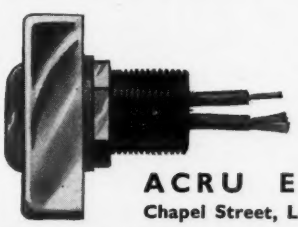

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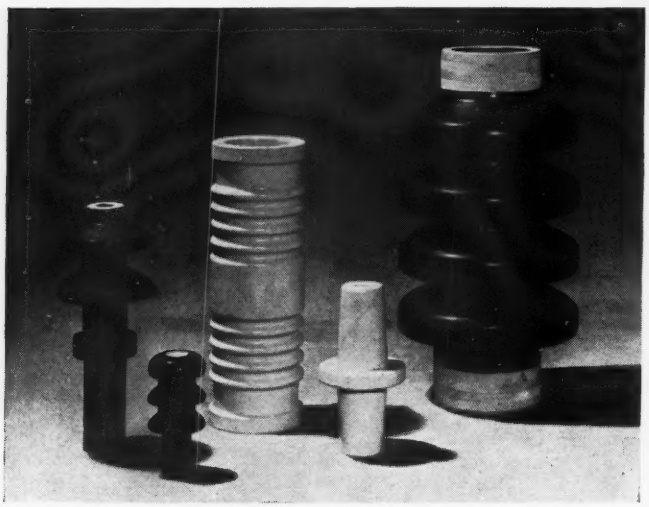

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MANUFACTURERS OF ELECTRICAL ENGINEERING PRODUCTS INCLUDING RADIO AND TELEVISION COMPONENTS

Careers in Electricity

This is an extract from a recorded interview with E. O. Maxwell, an established C.E.A. engineer, aged 26.

"...in Power Stations I could get variety and responsibility"

Q.M.: **What first made you come into the Industry?**

Mr. Maxwell: I saw an advertisement for graduate training and it struck me that in power stations I could get the type of experience I wanted—variety and responsibility.

Q.M.: **Any particular reason why you chose this part of the world?**

Mr. Maxwell: Only that my people were living in the South of England so I voted to do my training here.

Q.M.: **After your training . . .?**

Mr. Maxwell: I was appointed Assistant Engineer—plant testing—Croydon B. My first ambition, of course, was to be in charge of a shift.

Q.M.: **Which you were. Weren't you a Charge Engineer before you were 23?**

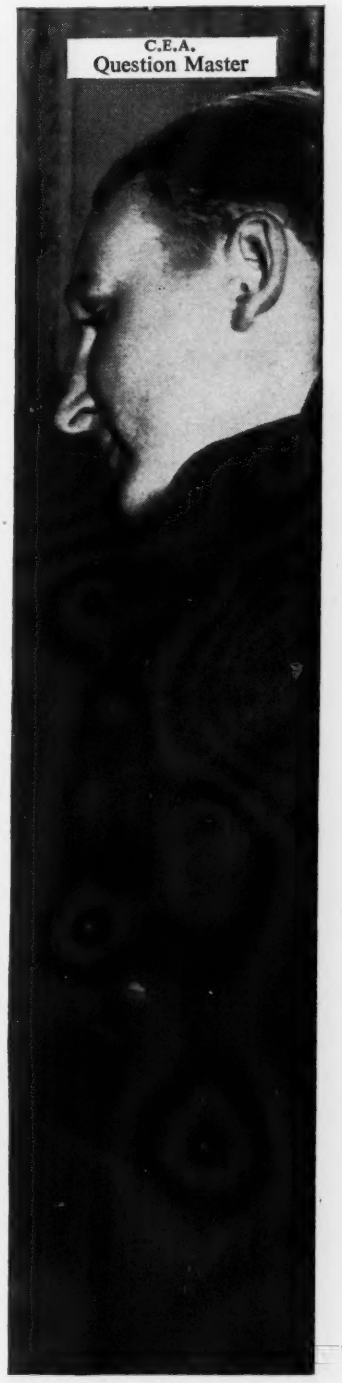
Mr. Maxwell: Yes. Assistant two years and two months, then Charge Engineer. I was very keen on being responsible for staff and it suited me fine.

Q.M.: **What are your plans now?**

Mr. Maxwell: Well, my plan at the moment is to gain as much experience of the design and construction—construction side mainly—of nuclear power stations. Actually I shall be going, for two years, to one of the Atomic groups in about four weeks' time. My ultimate aim is really to get back into power stations.

Q.M.: **You don't see yourself spending all your time in a nuclear power station?**

Mr. Maxwell: Oh, no. I'm much too young at the moment to specialise. I want to get as much general experience as I can.



We'd like to publish more of this interview, but there isn't space. For details of the many careers in Electricity Supply, and the salaried training schemes available, please write to:

The Education and Training Officer,
Central Electricity Authority,
12 Winsley Street,
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CEA

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The essential painting of factory plant and buildings presents special problems. Heavily soiled surfaces, corrosive atmospheric conditions, difficulty of access and shortage of time are typical.

Part of Pinchin Johnson's service to industry is the provision of paints ***designed to speed and simplify*** this work, backed by a technical advisory department that will gladly offer suggestions or complete specifications on request.

A finish of almost universal application and, therefore, widely used in factory painting, is FIGARO 2-star Durable Hard Gloss Paint. Full information and colour range are assembled in this booklet for the use of factory managers and maintenance engineers.

Write for Booklet F.4 to your nearest P.J. branch.

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Whilst exaggeration may be commonplace in piscatorial circles, it is a fact that HBC cartridge fuse-links of "Ferguson Pailin" manufacture are outstanding in their class.

The safety of a circuit may well depend on that small but important component, the cartridge fuse-link, and we suggest it would be well to equip the system with HBC fuse-links without delay.

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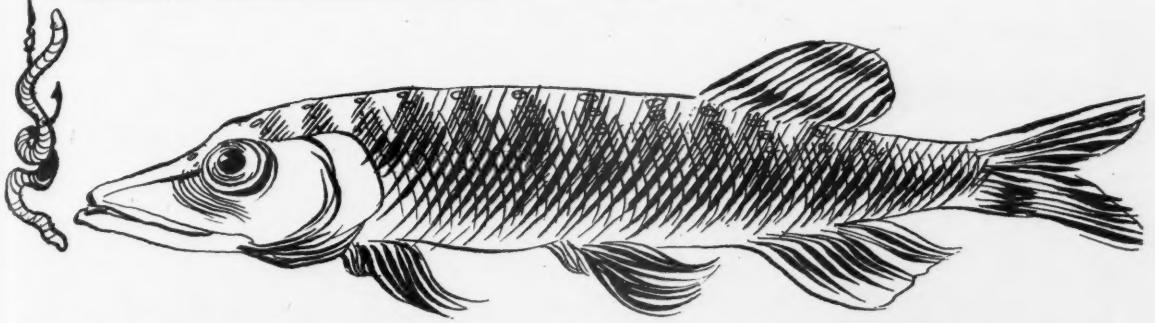
		440AC4	440AC5
Q4A10	10	3195	3194
Q4A30	30	3199	3198
Q4A60	60	3204	3202
Q5B100	100	3157	3158
Q6B200	200	3159	3160
Q7B300	300	3161	3162
Q8F400	400	3460	3461
Q9F500	500	3462	3463

The "FERGUSON PAILIN" type 'Q' high breaking capacity cartridge fuse-links, complying with B.S.88/1952, are manufactured under controlled conditions to ensure consistent performance and interchangeability.
They are available with centre or offset tags. Write for Cat. leaflet 73A2 which gives full details.



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Watertight Plugs and Sockets for Outdoor Crane Work

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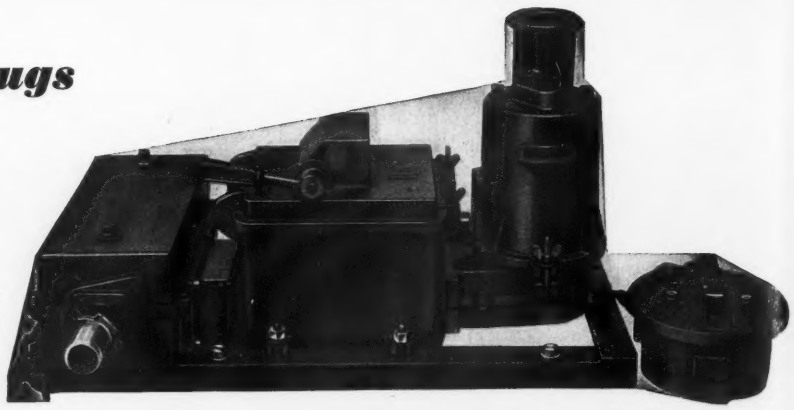

THIS DOCK PLUG IS FOR INSTALLATION IN A PIT, OR ON GROUND LEVEL

The travelling crane passes directly over the plug and socket, and the slack in the flexible trailing cable is wound on a drum, thus making it unnecessary to un-plug and re-connect when the crane passes the plug point. The plug and socket swing through a maximum angle of 220°.

All designs of Weekes' Watertight Plugs and Sockets can be made in ratings up to 300 amps. 500 volts, with two, three or four contact pins.

Advise us of your requirements; we can probably meet every one of them.

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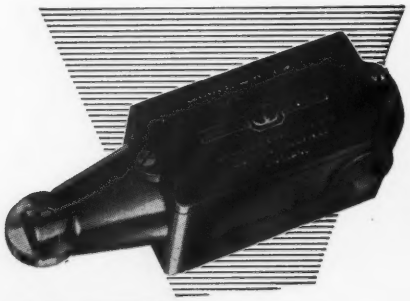

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MODEL R1710
WODEN

SPE

General Description—Rail-mounted, full-circle-slewing, c
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Power Unit—Ford diesel 45 h.p. at 1800 r.p.m.

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Brakes—Electro-mechanical automatically applied on Ho
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Wheels—4 single flange steel.

Driver's Cab—Totally enclosed, full vision, with safety

Limit Switches—Automatic self-resetting fitted to Hoi

Radius Indicator—Showing maximum loads at variou

Equipment—Electric starter, air whistle and instr
tool kit.

Jibs—Strut type lattice construction. Standard lengt
10' 0", 15' 0", 20' 0" and 30' 0"

Speeds—

HOISTING on Single Line.

Load, tons	...	3½	2	1
Speed, f.p.m.	...	65	80	120

DERRICKING—Maximum to minimum radius in

SLEWING—1¼ r.p.m.

TRAVELLING—500 f.p.m. on straight level track

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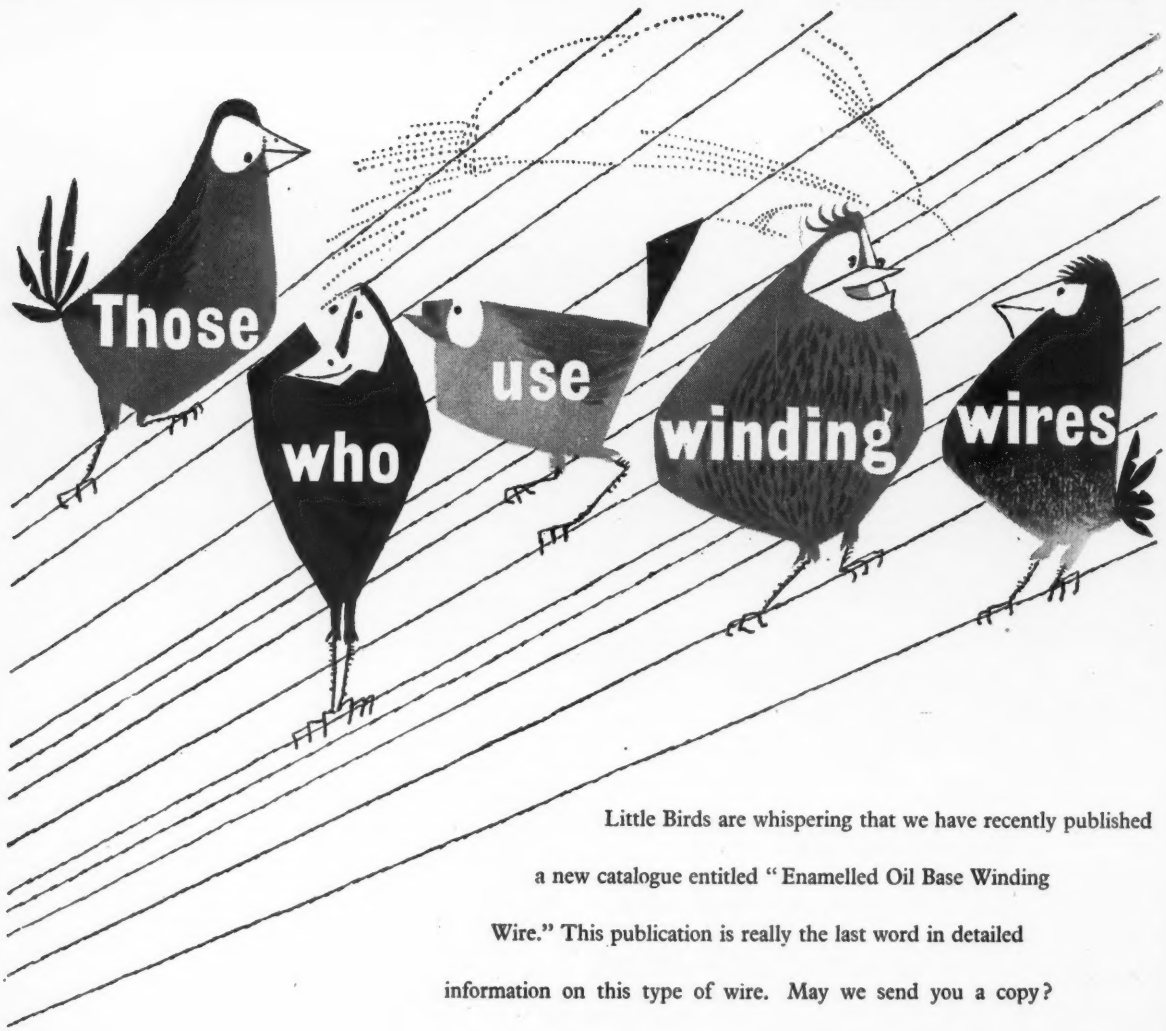
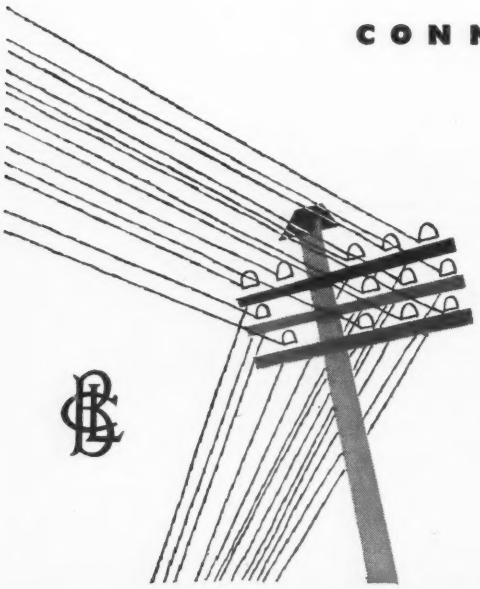


Little Birds are whispering that we have recently published a new catalogue entitled "Enamelled Oil Base Winding Wire." This publication is really the last word in detailed information on this type of wire. May we send you a copy?

CONNOLLYS *Winding Wires*



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CW2

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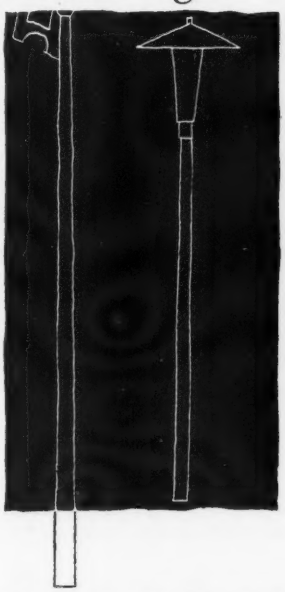
provides light on time at lower cost



The new type "K" Mark II Time Switch meets the demand for a simple synchronous motor driven switch, low in cost yet accurate and reliable in use.

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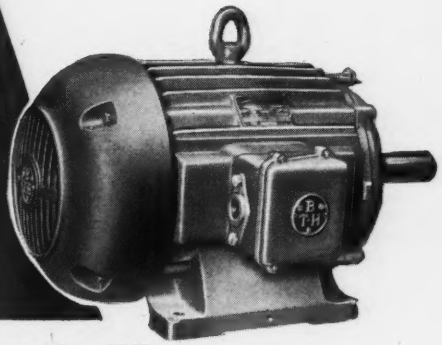

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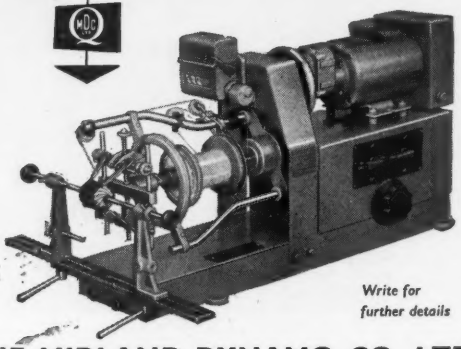

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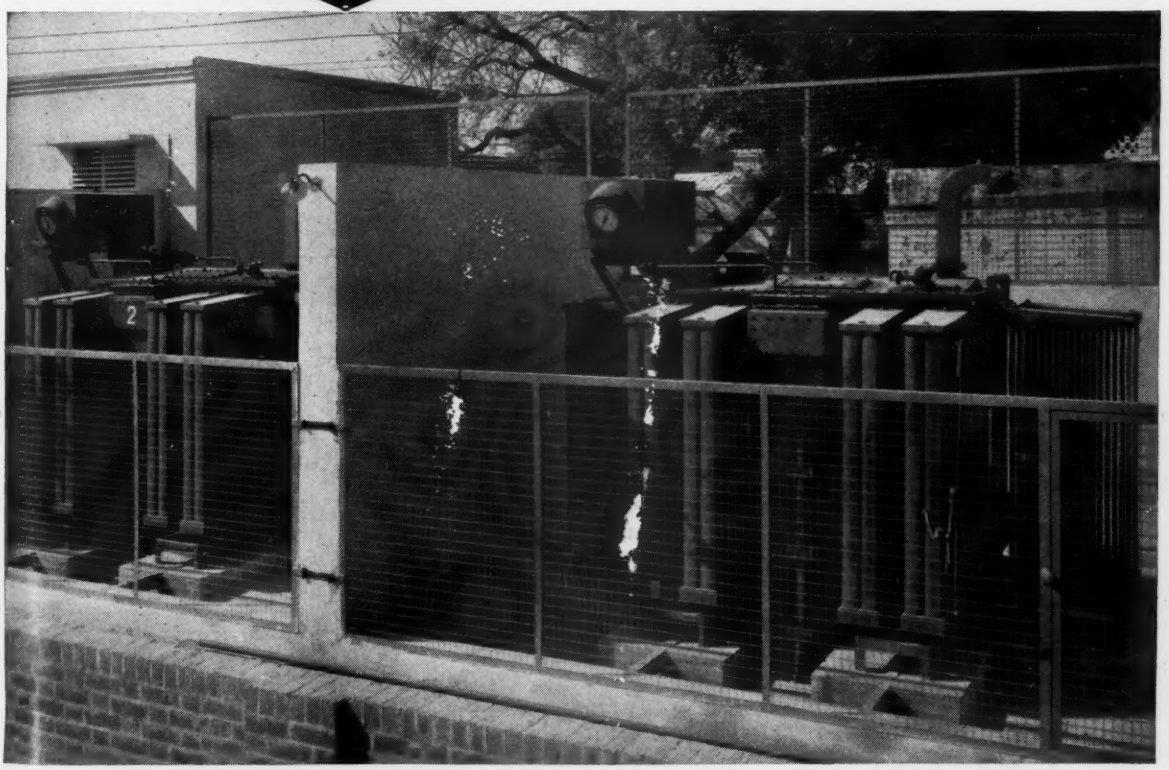

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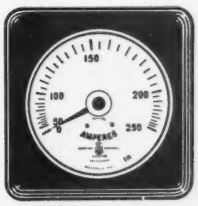

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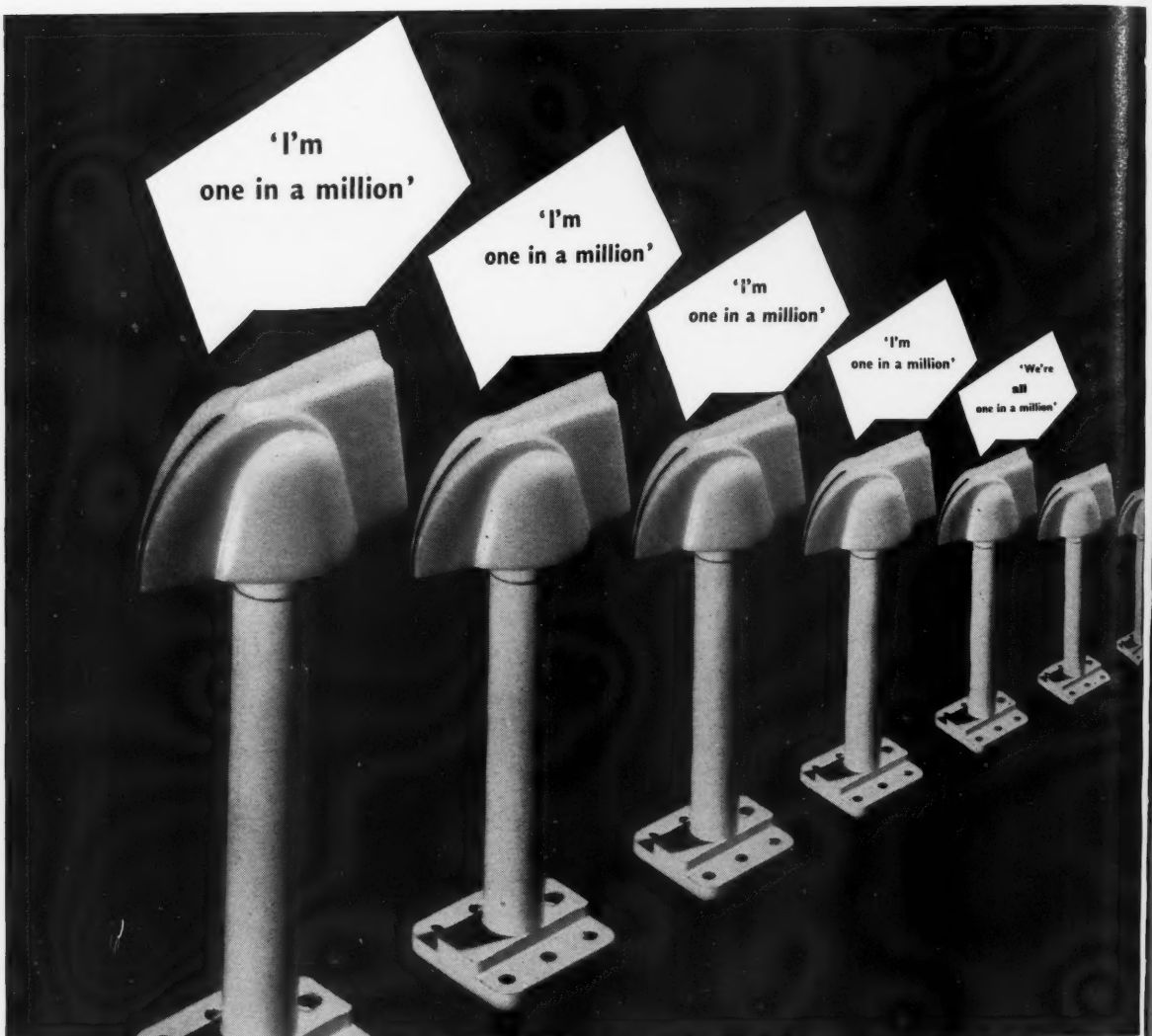

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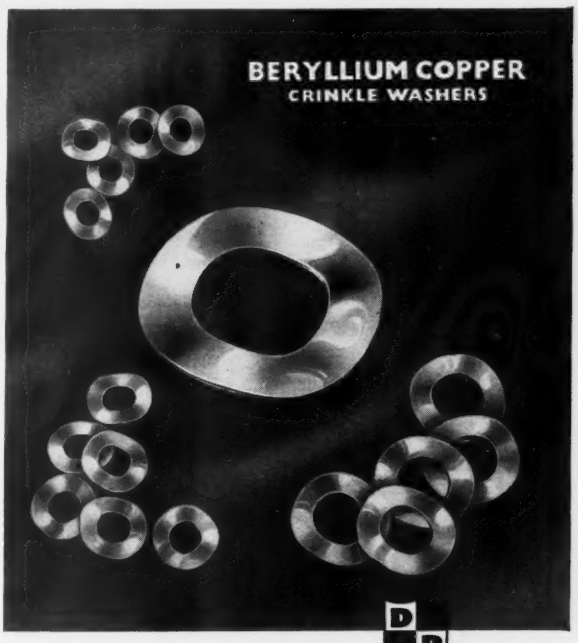

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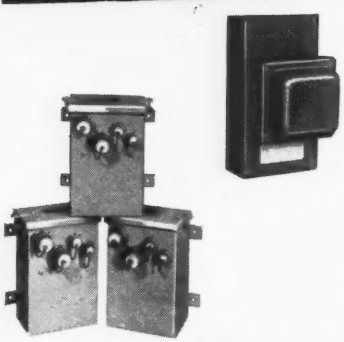

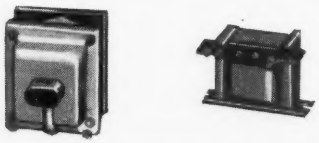

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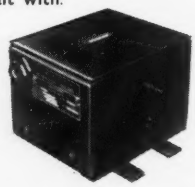

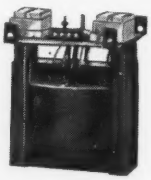

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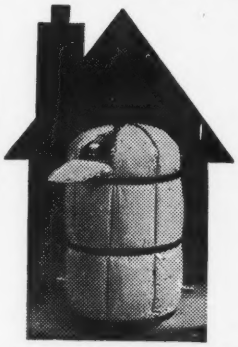

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1½	3000 1000	1500 750
2	3000 1000	1500 750
3	3000 1000	1500 750
5	3000 1000	1500 750
7½	3000 1000	1500 750
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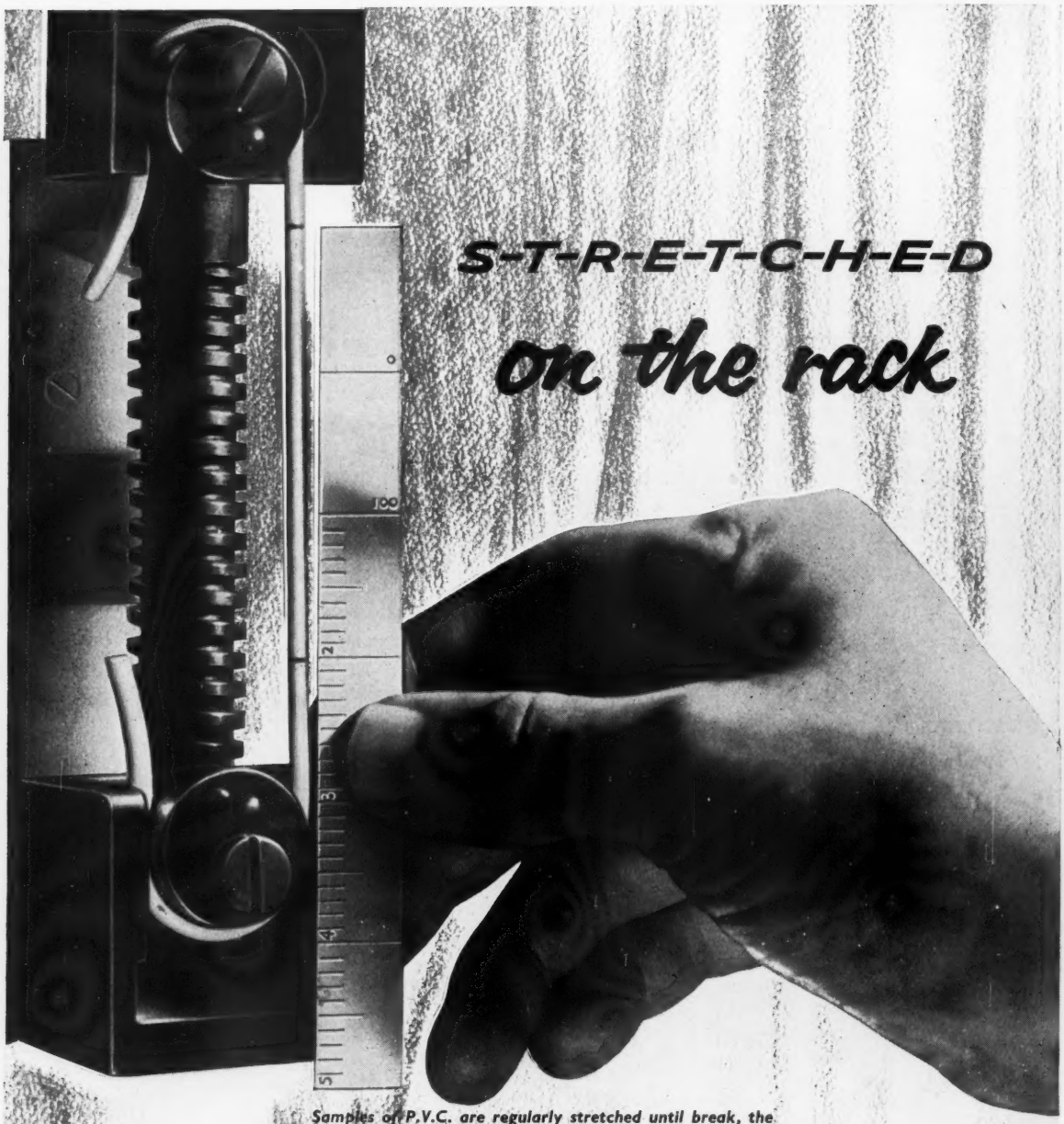
30	3000	1500
40	3000	1500
50	3000	



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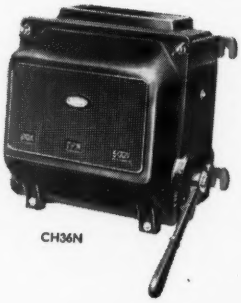
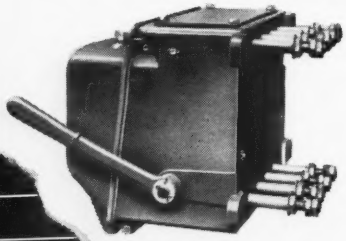


CH36N

BACK CONNECTED PATTERN SWITCHES



CH320N/B

This pattern is the standard switch provided with insulated screwed stems protruding through the back of the switch complete with locknuts. This type is for mounting on the front of cubicles so that connections of either cable or solid copper can be made to the back of the switch inside the cubicle. The catalogue prefix is CH—/B or CS—/B.

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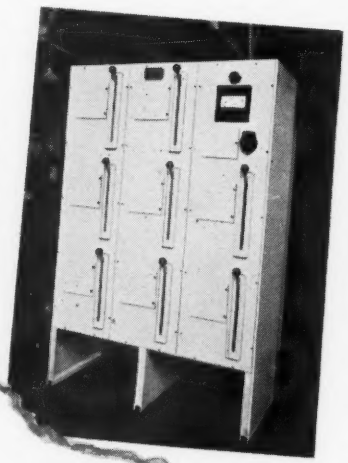

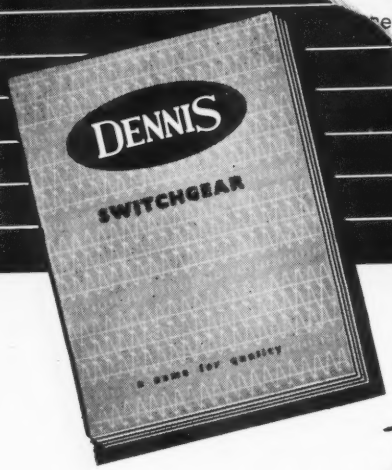

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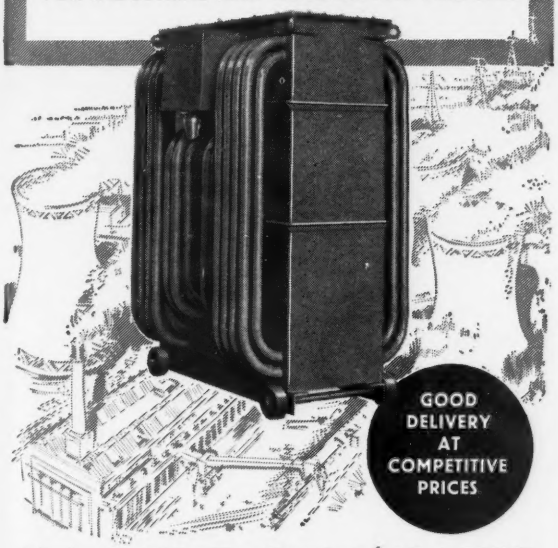

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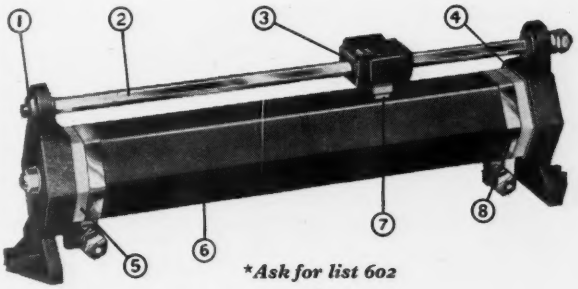

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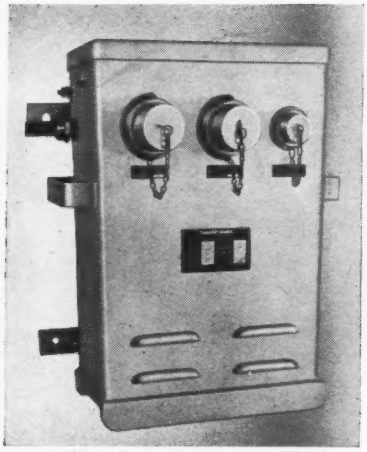
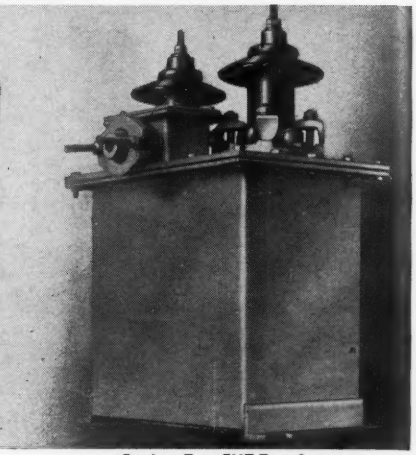


2 kV Low Voltage Transformer to BS 794

EHT Transformer



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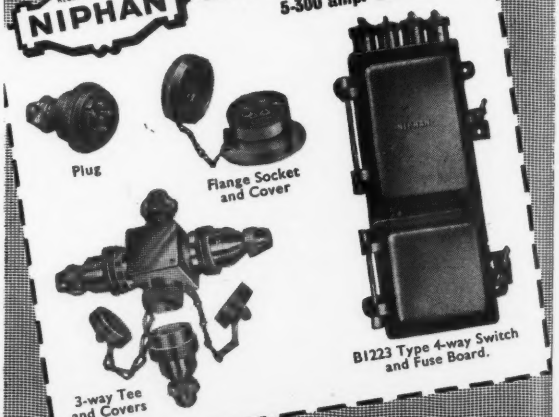

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MANUFACTURING ELECTRICAL ENGINEERS
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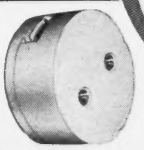
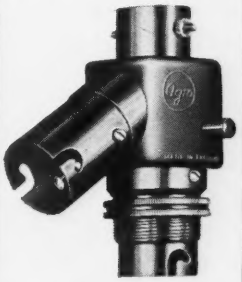
No. 6040—B.C. Push-bar Lampholder, Cord grip or threaded types available.

No. 6032—S.C., B.C. Batten-holder. 2" fixing centres, brown bakelite.

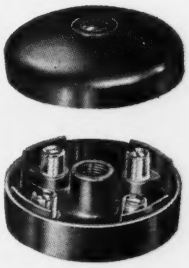


No. 8260—Bi-pole Connector (cream bakelite) for use with fluorescent tubes with bi-pin caps.

No. 8100—Door Switch. Push to break or push to make. Flush and surface types.



No. 7700—Two-light Adaptor with Switch (brown bakelite). Incorporates the best features of switch design.



No. 1710—Junction Boxes (brown bakelite). 2¼" diameter.
No. 7170—As above but 3" diameter.

Where excellence of design and trouble-free qualities are essential—always specify AGRO!

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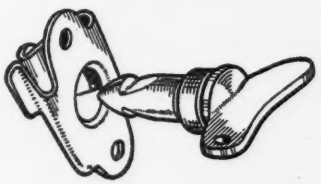

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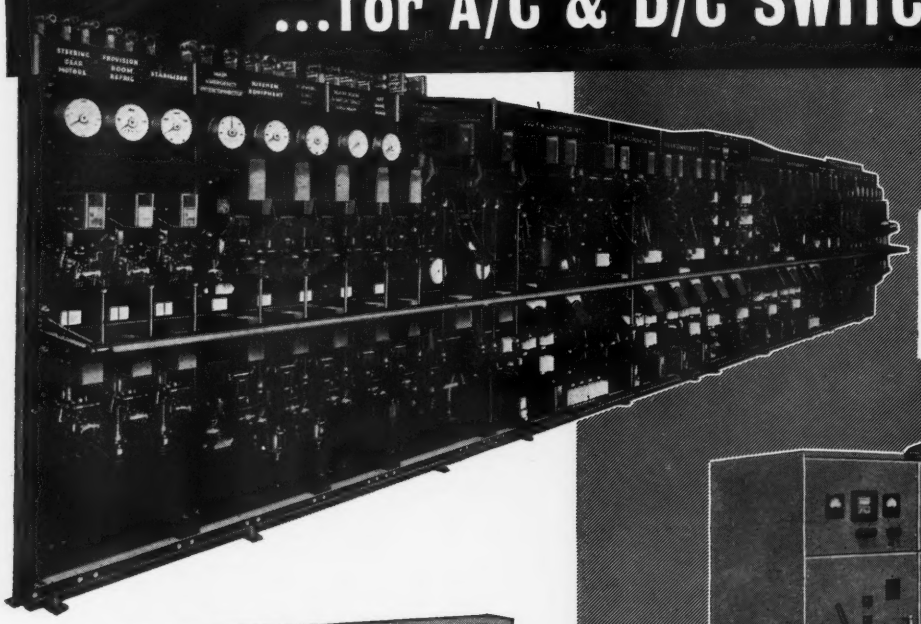
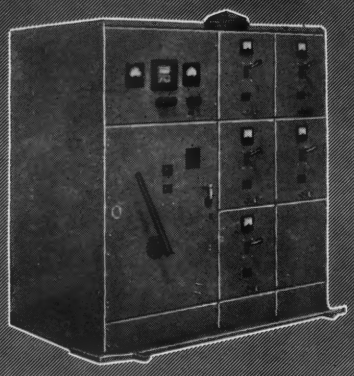
...for A/C & D/C SWITCHGEAR



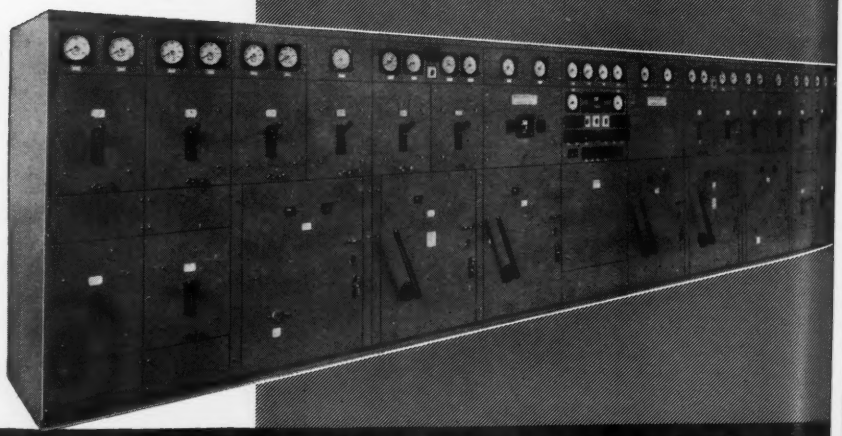
A typical example of an OPEN TYPE D/C SWITCHBOARD as supplied for Steel Works and marine installations.



A fine example of an A/C BOARD constructed for a large steelworks in this country.

The above photograph shows in some detail an A/C INDUSTRIAL TYPE SWITCHBOARD supplied to a large tyre manufacturer

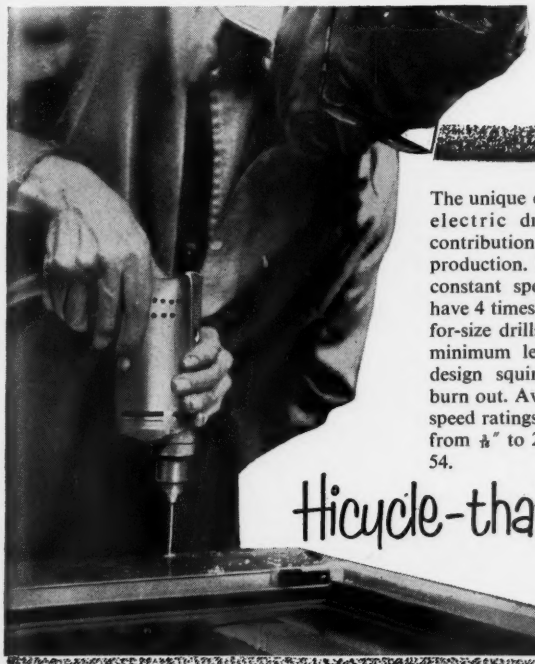
A D/C CUBICLE TYPE SWITCHBOARD equipped with withdrawable D/C breakers, as supplied to Harbour Boards, Steelworks and Atomic Power Stations.



ALL A/C BREAKERS ARE CERTIFIED IN ACCORDANCE WITH B.S.S. 116 & 936 for 25 and 31 M.V.A. at 400 volts.

WHIPP & BOURNE LIMITED

SWITCHGEAR SPECIALISTS | CASTLETON ROCHDALE LANCS



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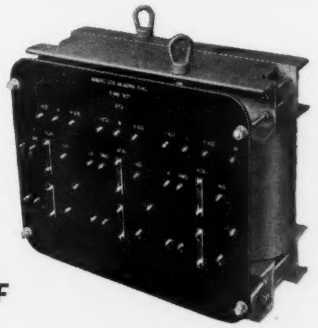

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We invite orders for open type transformers from 1 kVA to 10 kVA, single or three phase. Quantities from one to six can be executed within three to four weeks from receipt of customers' final instructions.

Our range extends from 5 VA to 50 kVA with many types of construction available.—Open type, fully varnished, to RCS.214 H2, oil filled, hermetically sealed, etc.

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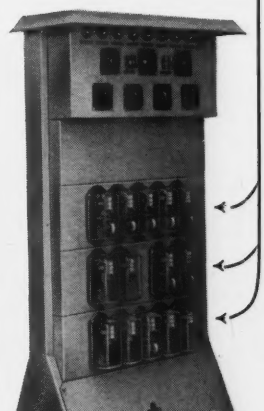

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the technology and uses of ethylene polymers

a comprehensive appraisal by British & American experts of one of the most important plastics materials

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A very great deal of technical knowledge has been accumulated during the recent years in which polythene had advanced to a dominant position among plastics materials. This new book assembles all the relevant facts for the technologist. But it is more than a survey of current literature ; it is essentially a critical analysis of the available data and will serve as the authoritative text for technologists, not only in the plastics industry but in those many other industries where polythene is used in considerable quantities. Thirty-eight specialists in Great Britain and the United States have contributed to the book's 32 chapters. New developments are constantly taking place in the whole of this field and no effort has been spared to ensure that the latest available information was included at at the time of going to press.

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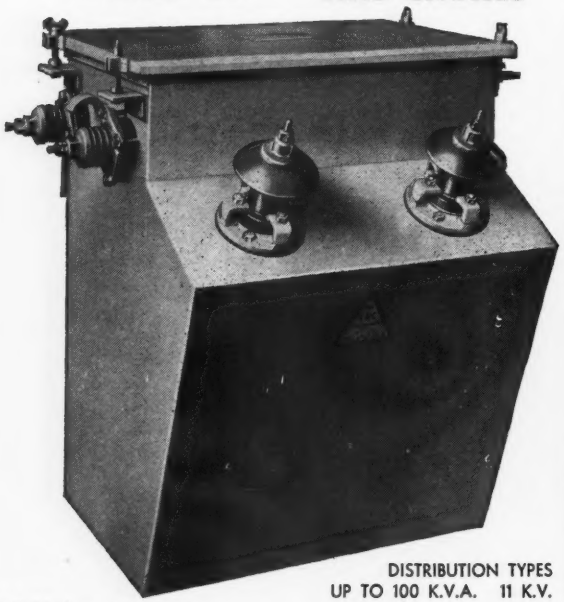

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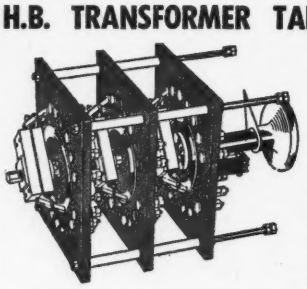

Interlocked with micro break switch

Pull Handle to release Lock, then turn

Also Type O without interlock and Type C for on load switching

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Fluvent Cubicle Type Switchboard recently supplied to British Crepe Ltd.

Fluvent Power Pillars—fully described in publication PP1, available on request.

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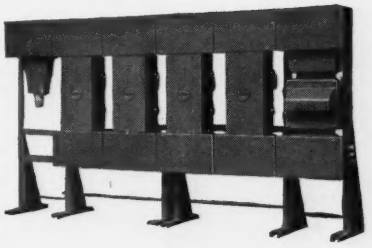
Energy Distribution for today's conditions demands fresh approaches. The examples illustrated are typical contributions by us to meet individual needs of widely different character.



Aeroflex Unit Type Switchboard, arranged so that any of the four outgoing circuits can be switched to either side of the busbars.

Parmiter Hope & Sugden Ltd

MANCHESTER 12

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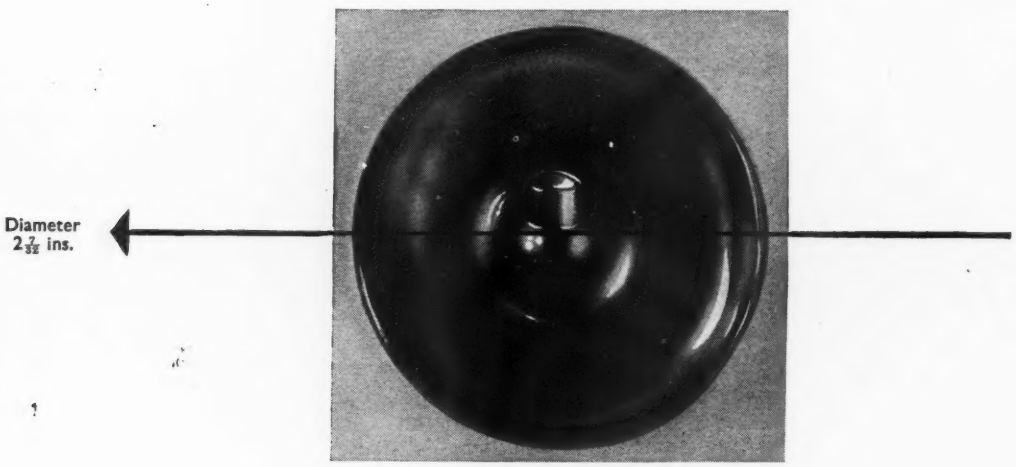
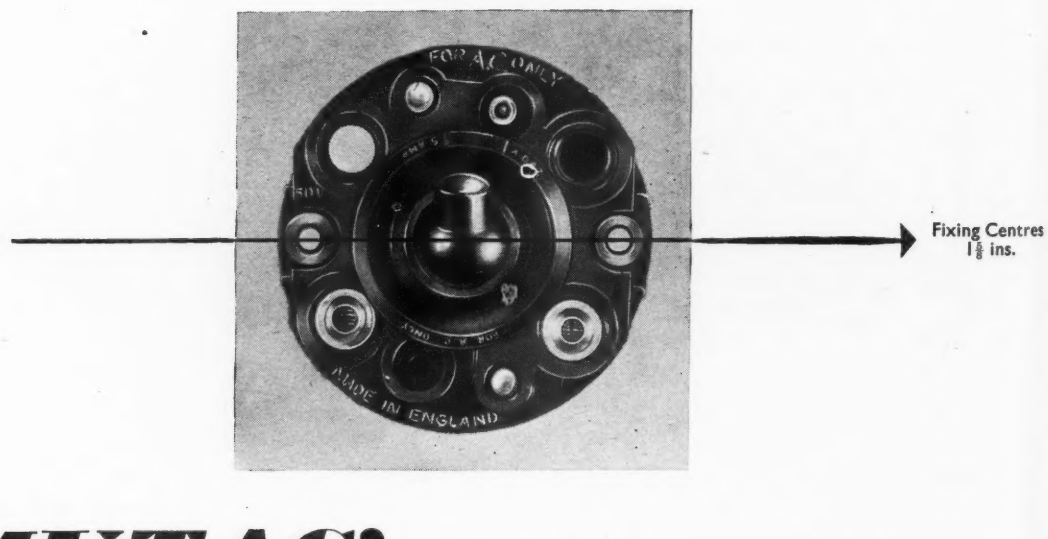
S.3425— 5 AMP. SINGLE POLE
'MUTAC' SURFACE SWITCH

with terminals below the centre line



allows direct replacement of old type switches without alterations to existing blocks or wiring



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REPLIES to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

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Original testimonials should not be sent with applications for employment

OFFICIAL NOTICES, TENDERS, ETC.

BOROUGH OF STRATFORD-UPON-AVON

Bath-Lincoln Trunk Road, A.46, A.432, A.439

Street Lighting

TENDERS are invited for:—

(a) Supply of 40 25′ steel columns.

(b) Erection and wiring of 40 25′ columns and supply of 61 lanterns for 500-w. tungsten lamps, with 56 time switches, fuses, etc.

Contractors may tender for either section (a) or (b) or for both parts.

Specifications, bills of quantities and forms of tender may be obtained from the undersigned on payment of a deposit of £2 2s., which will be returned on receipt of a bona fide tender.

Tenders must be delivered to the Town Clerk, 2, Sheep Street, Stratford-upon-Avon, not later than noon on Friday, 26th July, 1957.

The Council do not bind themselves to accept the lowest or any tender.

P. C. SMART, M.I.C.E.,
Borough Engineer and Surveyor.

Municipal Offices,
Stratford-upon-Avon.
21st June, 1957. 6457

BOROUGH OF WILLESDEN

Street Lighting: Harrow Road, Craven Park (part), Craven Park Road, Harlesden High Street, Station Road

TENDERS are invited from experienced contractors for the following Group "A" lighting work to be carried out as separate contracts over a length of approximately three miles of Class I highway:—

(a) Supply of sodium lanterns and ancillary equipment.

(b) Supply and erection of concrete columns, wiring and fixing of lanterns and ancillary equipment.

The contract documents may be obtained from the Borough Engineer and Surveyor, Town Hall, Dyne Road, Kilburn, London, N.W.6, upon application accompanied by a deposit of two guineas, which will be returned upon receipt of a bona fide tender not subsequently withdrawn.

Sealed tenders must be submitted so as to reach the undersigned by not later than 10 a.m. on the 22nd July, 1957.

R. S. FORSTER,
Town Clerk.
Town Hall,
Dyne Road,
Kilburn, London, N.W.6. 6498

CITY OF MANCHESTER

TENDERS invited for Electrical Installation to Extensions at Burnage Grammar School. Specification and drawings from City Architect, P.O. Box 488, Town Hall.
Tenders returnable by 27th July. 6508

CITY OF MANCHESTER

TENDERS are invited for the supply of Electric Lamps. Tender forms returnable by 17th July, 1957, obtainable from the City Surveyor, Town Hall, Manchester, 2. 6540

THE ELECTRICITY TRUST OF SOUTH AUSTRALIA

Port Augusta "B" Power Station

Boiler Flue Dust Collecting Plant

TENDERS are invited for the supply, delivery, erection and commissioning of boiler flue dust collecting plant for five 360,000 lb. per hour boilers at the above power station, each plant to pass 176,000 c.f.m. of boiler flue gas.

Specifications are available at the offices of the Design Engineer, Hindmarsh Buildings, Grenfell Street, Adelaide, and Preece, Cardew & Rider, Consulting Engineers, 8, 10 & 12, Queen Anne's Gate, Westminster, London, S.W.1.

Tenders, in duplicate, must be lodged with the Chairman, Purchasing and Contracts Committee, Electricity Trust of South Australia, Kelvin Building, North Terrace, Adelaide, South Australia, by 27th August, 1957. A further copy of the tender must be lodged with Preece, Cardew & Rider on the same day. 6525

SITUATIONS VACANT

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:—

Central Gloucestershire Sub-Area Headquarters

SECOND ASSISTANT ENGINEER (Control).

Duties include assistance in the establishment of a new control and subsequent operation, preparation of switching instructions, routine relay settings, etc. Technical qualifications desirable. Salary £1,065/£1,140 per annum (N.J.B. Grade J.7).

SENIOR ASSISTANT (Accounting Department).

Duties will include responsibility to the Senior Assistant in charge for stores accounting and control records, clearance and payment of creditors' invoices, payment of rents and wayleaves. Experience in punched-card methods would be an advantage and the possession of a recognised accountancy qualification is desirable. Salary £735/£810 per annum (N.J.C. Grade 4).

Apply by letter within fourteen days, stating age, experience, qualifications, present position and salary, to Mr. S. Raybould, Sub-Area Manager, Midlands Electricity Board, 126, London Road, Gloucester.

Birmingham and District Sub-Area Headquarters

FOURTH ASSISTANT ENGINEER and GENERAL ASSISTANT ENGINEER (Technical and Planning Section).

The successful applicants will be required to assist in the design of the H.V. and M.V. systems, analysis of loading conditions, the preparation of specifications, layout of plant and equipment, and technical investigations. Technical qualifications desirable. Salary: Fourth Assistant Engineer, N.J.B. Grades M.13/12, £885/£995 per annum; General Assistant Engineer, N.J.B. Grades M.18/14, £635/£880 per annum, according to qualifications and experience.

Apply by letter within fourteen days, stating age, experience, qualifications, present position and salary, to Emil Braathen, Sub-Area Manager, Midlands Electricity Board, 14, Dale End, Birmingham, 4.

A. STEPHENS,
Secretary. 6541

CENTRAL ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the following positions:—

ASSISTANT CHEMIST (Oil Firing), MARCHWOOD GENERATING STATION (S/13.928).

An Assistant Chemist is required for work connected with the efficient burning of heavy fuel oil.

The person appointed will be required to organise and interpret the results of a programme of plant trials to overcome the problems associated with the burning of fuel oils in modern high pressure boilers.

A good knowledge of the operation of modern high pressure boiler plant is required together with sufficient chemical knowledge to undertake analysis of gas side boiler deposits and interpret their significance.

Applicants should preferably have a degree in chemistry or an equivalent qualification.

Salary N.J.B. K/9, £995-£1,055.

ASSISTANT ENGINEER (Mechanical Maintenance), POOLE GENERATING STATION (S/13.929).

Applicants should have experience in the maintenance of modern generating station power plant and be capable of taking control of maintenance staff and supervising turbine and boiler overhauls. Preference will be given to those possessing qualifications leading to corporate membership of a recognised professional institution.

Salary: N.J.B. J/9, £935-£995.

FOURTH ASSISTANT ENGINEER, SYSTEM OPERATION LIAISON DEPARTMENT, DIVISIONAL HEADQUARTERS (S/13.930).

Applicants should preferably have a Higher National Certificate (Electrical) or equivalent and should have some experience in the operation or control of inter-connected power systems, or in the operation of power station plant.

Salary N.J.B. AX/CX, £710-£885.

Special application forms, for each of these positions obtainable from P. D. A. Oliver, Divisional Secretary, 111, High Street, Portsmouth, should be returned by 14th August, 1957. 6543

CENTRAL ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement. Salary includes London allowance.

QUANTITY SURVEYING ASSISTANTS, CONSTRUCTION DEPT., DIV. H.Q., ERGON HOUSE (Vacancy No. 57/590).

Duties comprise office and site work including some taking off. Good ability to measure work in progress the major consideration. Applicants should preferably be A.R.I.C.S. or studying. (Previous applicants to Vacancy 57/440 need not re-apply.)

Salary Class AX/EX, Grade 5 = £860/£1,085 p.a.

Applications, quoting vacancy number, may be made on form obtainable from Divisional Secretary, Central Electricity Authority, London Division, P.O. Box 136, Generation House, Great Portland Street, London, W.1, and be received within 10 days of this advertisement. 6510

***Situations Vacant** (continued)*

CENTRAL ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following positions in this Division :—

FOURTH ASSISTANT ENGINEER (Section), NORTHAMPTON TRANSMISSION SECTION (Vacancy No. 98/57/ER).

Applicants should have experience of the maintenance and operation of high-voltage overhead lines, transformer and switchgear up to 132 kV.

Preference will be given to candidates with qualifications leading to Corporate Membership of the Institution of Electrical Engineers.

Salary will be in accordance with Class AX/EX, Grade 6 (£710-£935 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 17th July, 1957.

FOURTH ASSISTANT ENGINEER (Section), DRAKELOW TRANSMISSION SECTION (Vacancy No. 99/57/ER).

The section contains extensive 275-kV and 132-kV equipment and the candidates must have had wide experience in the maintenance and operation of 132-kV lines and substations in a transmission section.

Preference will be given to candidates with qualifications leading to Corporate Membership of the Institution of Electrical Engineers.

Salary will be in accordance with Class AX/EX, Grade 5 (£810-£1,035 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 17th July, 1957.

DEPUTY STATION SUPERINTENDENT, WILLINGTON "A" POWER STATION (Vacancy No. 101/57/ER).

Candidates should have had a wide experience in the operation, maintenance and administration of a modern power station, and a knowledge of pulverised fuel firing will be an advantage.

Preference will be given to candidates possessing technical qualifications leading to Corporate Membership of one of the recognised professional institutions.

Salary will be in accordance with Class K, Grade 3 (£1,560-£1,665 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 17th July, 1957.

SHIFT CHARGE ENGINEERS, WILLINGTON "A" POWER STATION (Vacancy No. 102/57/ER).

Candidates should have a sound technical training and considerable experience in a modern generating station. Preference will be given to candidates who are Graduate Members of the Institution of Electrical or Mechanical Engineers or who hold similar qualifications, and knowledge of pulverised fuel firing will be an advantage.

The salary will be in accordance with Class K, Grade 7 (£1,160-£1,235 per annum) of the National Joint Board Agreement, plus 10% for shift duties.

Closing date for receipt of applications, 17th July, 1957.

PLANT CONTROL ENGINEERS, WILLINGTON "A" POWER STATION (Vacancy No. 103/57/ER).

Candidates should have a sound technical training and experience of the operation of a power station, including electrical control room experience.

Preference will be given to candidates who possess technical qualifications to Higher National standard, and experience of pulverised fuel firing will be an advantage.

The salary will be in accordance with Class K, Grade 10 (£935-£995 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 17th July, 1957.

SECOND ASSISTANT CHEMIST, CASTLE DONINGTON POWER STATION (Vacancy No. 104/57/ER).

Candidates should have had previous experience in a power station laboratory and should hold the Higher National Certificate in Chemistry. They should be familiar with the methods of sampling and analysis of coal, water, oil and other materials and with the interpretation and application of the analytical results.

Salary and conditions of service will be in accordance with Class L, Grade 11 (£935-£995 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 17th July, 1957.

ASSISTANT SHIFT CHARGE ENGINEER, SPONDON POWER STATION (Vacancy No. 107/57/ER).

Applicants should have had a sound training and experience in a modern generating station. Preference will be given to candidates who possess the Higher National Certificate or its equivalent.

Salary will be in accordance with Class H, Grade 9 (£885-£930 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 24th July, 1957.

SENIOR ASSISTANT ENGINEER (Resident), CASTLE DONINGTON POWER STATION (Vacancy No. 108/57/ER).

The duties for the above position include general supervision of the erection and commissioning of all mechanical and electrical plant; for example, turbo-alternators and condensing plant, feed heating equipment, boilers, pumps, high-pressure steam and feed piping, switchgear, transformers and cable, coal and ash handling plant and ancillary equipment. Corporate Membership of the Institution of Mechanical Engineers or the Institution of Electrical Engineers would be a recommendation.

Candidates should be experienced in the supervision of such power station equipment and in co-ordinating work on site in close collaboration with the Resident Engineer responsible for civil engineering and building works and with Divisional Headquarters staff.

Salary will be in accordance with Class AX/EX, Grade 1 (£1,330-£1,595 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 24th July, 1957.

FIRST ASSISTANT STATION CHEMIST, NORTH WILFORD POWER STATION (Vacancy No. 109/57/ER).

Candidates must have had previous experience in a power station laboratory and should preferably be qualified for admission to the Associateship of the Royal Institute of Chemistry; consideration will however be given to suitably experienced holders of the Higher National Certificate in Chemistry.

Applicants must be familiar with the routine methods, sampling and analysis (including physical testing) of coal, oil, water and other materials and with the interpretation and application of the analytical results.

Salary will be in accordance with Class K, Grade 9 (£995 - £1,055 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 24th July, 1957.

These appointments will be pensionable within the provisions of the Central Electricity Authority and Area Boards (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Authority, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote vacancy number.

L. F. JEFFREY,
Divisional Controller.

26th June, 1957. 6511

ELECTRICAL ENGINEER DRAUGHTSMAN

AN opening exists for an ELECTRICAL ENGINEER DRAUGHTSMAN to prepare specifications and factory distribution schemes in connection with modernisation projects.

This position offers good scope for advancement in a large organisation.

Please write in confidence, giving age, experience, qualifications and salary required, to Personnel Manager (ME), Fort Dunlop, Erdington, Birmingham, 24.

6558

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments in the Northmet Sub-Area. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Sub-Area Headquarters, London, N.14

SUB-AREA ENGINEER (77/57.R).

Candidates should be Corporate Members of the Institution of Electrical Engineers and must have had extensive experience in the planning, operation, maintenance and construction of large distribution systems covering both urban and rural areas.

Salary will be in accordance with Scale 5 of the National Joint Managerial and Higher Executive Grades Agreement (£1,975 × £50 to £2,125) plus London allowance.

Apply by letter to C. C. Hill, B.Sc.(Eng.), M.I.E.E., M.I.Mech.E., Manager, Northmet Sub-Area, Eastern Electricity Board, Northmet House, Southgate, London, N.14, so as to be received not later than Wednesday, 17th July, 1957.

Applications received in response to the previous advertisement (47/57.R) will be considered, and those applicants need not re-apply.

GENERAL ASSISTANT ENGINEER (79/57.N).

Candidates should have had a good general and technical education and possess the Higher National Certificate or equivalent qualifications. Previous experience in planning and development work will be an advantage.

Salary N.J.B. Class M, within a range of £540-£880 plus London allowance, the grade to be dependent upon qualifications and experience.

Apply by letter to C. C. Hill, B.Sc.(Eng.), M.I.E.E., M.I.Mech.E., Manager, Northmet Sub-Area, Eastern Electricity Board, Northmet House, Southgate, London, N.14, by 15th July, 1957.

Hertford District

(a) FOURTH ASSISTANT ENGINEER (80/57.R).

(b) GENERAL ASSISTANT ENGINEER (78/57.R).

Candidates for (a) should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems, including substations.

Candidates for (b) should have had a good general and technical education and should possess the Higher National Certificate in Electrical Engineering or an equivalent qualification.

Salary N.J.B. Class F, as follows :—
(a) Grade 11 (£685-£730).
(b) Grade 12 (£635-£680).

Apply by letter to W. H. Hatton-Ward, Assoc. I.E.E., District Manager, Eastern Electricity Board, Bridgefoot, Ware, Herts, by 15th July, 1957.

St. Albans District

(a) SALES REPRESENTATIVE (Ref. 678) (81/57.R).

(b) SALES REPRESENTATIVE, Hatfield Service Centre (Ref. 700) (82/57.R).

The duties will be advising consumers on commercial matters associated with supply, tariffs and apparatus sales, in accordance with the N.J.C. Agreement. The successful candidate for appointment (b) will be expected to assist with service centre work when required and to work the normal service centre hours.

Salary for each appointment, N.J.C. 1 (£490-£590).

Apply by letter to F. J. Drake, Assoc.I.E.E., District Manager, Eastern Electricity Board, 107, St. Peter's Street, St. Albans, by 15th July, 1957. 6542

SALES MANAGER

APPLICATIONS are invited for the above position which will shortly become vacant in a well-known electrical accessory manufacturing company. Applicants must possess good personality, a high degree of initiative and considerable drive, and be able to develop and expand sales through existing representatives and agents.

A high salary is offered to suitable applicant, and a contributory pension scheme is in operation.

Applications will be received in strict confidence, and should include full details of the candidate's career, together with salaries received.—Box 6529.

YORKSHIRE ELECTRICITY BOARD

No. 1 (Bradford) Sub-Area

SECOND ASSISTANT ENGINEER (Service Centres, Publicity and Domestic Sales).

Applicants should have had a sound training and wide experience in domestic and commercial sales development and be competent to advise consumers on all matters relating to utilisation, tariffs and apparatus.

The successful applicant will also be responsible for service centres, the training of sales staff, publicity, window display, demonstrations, lectures and the promotion of exhibitions. Technical qualifications will be an advantage.

Salary N.J.B. Class K, Grade 7, £1,160/£25/£1,235 per annum.

ENGINEERING DRAUGHTSMAN.

Applicants should have a good knowledge of the theory and principles applicable to the design, layout and construction of buildings, including site surveys. A knowledge of electrical plant and equipment would be an advantage but is not essential.

Salary N.J.B. Schedule D, Grade 6, £595/£20/£715 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45/53, Sunbridge Road, Bradford, not later than 19th July, 1957.

No. 5 (Wakefield) Sub-Area

PRINCIPAL ASSISTANT (Purchasing and Stores).

Applicants should have had experience in purchasing stores and equipment normally associated with electrical distribution work, service centre sales and office supplies. They must be capable of taking complete charge of the purchasing section, including the maintenance of records, order and invoice procedure, stock control, supervision of stores staff including manual workers, and the normal routine clerical work of a purchasing and stores section.

Salary N.J.C. Grade 7, £970/£30/£1,060 per annum.

WAKEFIELD DISTRICT

CONSUMERS' ENGINEER.

Applicants should be Corporate or Graduate Members of the Institution of Electrical Engineers or hold equivalent qualifications. They must have had a sound practical training and preferably experience in the work of a consumers' engineer's department. The successful applicant will be required to negotiate with consumers in respect of new and additional supplies, advise and deal with tariff problems, and be responsible for meter fixing, installation testing, load development, preparation of specifications, consumer fault service and street lighting work within the district. The successful applicant will be located in the Dewsbury unit of the Wakefield district.

Salary N.J.B. Class G, Grade 8, £885/£15/£930 per annum.

BARNSLEY DISTRICT

THIRD ASSISTANT DISTRICT ENGINEER.

Applicants should have a sound practical training and experience in the construction, operation and maintenance of H.V. and M.V. overhead and underground distribution networks, substation plant and ancillary equipment.

Candidates must be prepared to reside in the district and undertake standby duties.

Candidates should preferably have attained the technical standard of the Higher National Certificate in Electrical Engineering or equivalent qualifications.

Salary N.J.B. Class G, Grade 9, £835/£15/£880 per annum.

FOURTH ASSISTANT ENGINEER (Distribution Design).

Applicants must hold at least the Higher National Certificate in Electrical Engineering and should have had some experience in the construction, operation and maintenance of distribution networks and in the planning of H.V. and L.V. overhead and underground distribution systems and the design of substations. Experience in the preparation of reports, load estimates and capital budgets is desirable.

Salary N.J.B. Class L, Grade 13, £835/£15/£880 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a, Denby Dale Road, Wakefield, not later than 19th July, 1957.

No. 3 (Sheffield) Sub-Area

FOURTH ASSISTANT ENGINEER (Meters, Testing and Protection).

Applicants should have had experience in the testing and commissioning of substation equipment, protection gear, maintenance and testing, cable fault location and general electrical testing.

Candidates should possess qualifications equivalent to Higher National Certificate in Electrical Engineering.

Salary N.J.B. Class M, Grade 13, £885/£15/£930 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial Street, Sheffield, not later than 19th July, 1957.

No. 2 (Huddersfield) Sub-Area

HALIFAX DISTRICT

ASSISTANT INSTALLATION ENGINEER.

Applicants must have had experience in the preparation of specifications and estimates and generally supervising schemes for electrical installations of all types. A good knowledge of the Electricity Supply Regulations and the I.E.E. Regulations for the electrical equipment of buildings is essential. Graduate Membership of the Institution of Electrical Engineers or an equivalent qualification will be an advantage.

Salary N.J.B. Class H, Grade 12, £740/£15/£785 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 2 (Huddersfield) Sub-Area, Yorkshire Electricity Board, Market Street, Huddersfield, not later than 19th July, 1957.

No. 6 (Hull) Sub-Area

BRIDLINGTON DISTRICT (Driffield)

THIRD ASSISTANT DISTRICT ENGINEER (Commercial).

Applicants should have had a sound practical training in electrical installation work, and have an up-to-date knowledge of the utilisation of electrical equipment on farms. The successful applicant will be required to negotiate with consumers requiring electricity supplies, particularly in rural areas, and deal with estimates for installations, tariffs and sales development generally.

Candidates should have passed the Higher National Certificate in Electrical Engineering, or hold similar qualifications.

The successful applicant will be required to reside in Driffield or the near vicinity.

Salary N.J.B. Class E, Grade 9, £740/£15/£785 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Hull, not later than 19th July, 1957. 6550

SOUTH OF SCOTLAND ELECTRICITY BOARD

Lanarkshire Area

Third Assistant District Engineer (Newlands District)

APPLICATIONS are invited for the above appointment. Applicants should possess the necessary technical qualifications and should have had a sound engineering training, with some subsequent experience in the operation and maintenance of H.V. and L.V. distribution systems.

The salary and conditions of service will be in accordance with the National Joint Board Agreement, Schedule A. The present classification and grading is F9. Salary £790/£835 per annum. This post is superannuable, subject to satisfactory evidence of health. The successful candidate will require to reside within a reasonable distance of the district office at Newlands and to take part in standby duty in accordance with the above agreement.

Application forms, which may be obtained from the undersigned, should be returned to this office within 14 days of the date of this advertisement.

DUGALD SMITH,
137, Almada Street, Manager.
Hamilton. 6555

CENTRAL ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A or B. Salary includes London allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. an advantage.

STATION SHIFT CONTROL ENGINEER, TAYLORS LANE POWER STATION (Vacancy No. 57/588).

Applicants should have a good general education and technical training. Previous experience in operation and control of E.H.T. switchgear essential, together with knowldege of D.C. and A.C. L.T. distribution and rotary converter.

Salary Class F, Grade 10 = £780 p.a. plus £74 p.a. shift allowance.

STATION SHIFT CONTROL ENGINEER, BARKING A/B POWER STATIONS (Vacancy No. 57/589).

Applicants should have sound technical qualifications and experience in the operation of E.H.T. switchgear, etc., and control of large turbo-alternators.

Salary Class L, Grade 10 = £1,045 p.a. plus £99 10s. p.a. shift allowance.

Applications, quoting vacancy number, may be made on form obtainable from Divisional Secretary, Central Electricity Authority, London Division, P.O. Box 136, Generation House, Great Portland Street, London, W.1, and be received within 10 days of this advertisement. 6509

THE EAST AFRICAN POWER & LIGHTING CO. LTD.

invite applications for the following immediate permanent appointments in Nairobi, Kenya Colony :—

(a) SALES DEVELOPMENT CANVASSERS required to undertake door-to-door canvassing to sell domestic appliances and industrial equipment. Previous experience essential. Commencing salary £960-£1,200 p.a. plus £90 local allowance. Car provided.

(b) METER ENGINEER. Sound knowledge of the fundamentals of alternating current essential. Applicants must be competent in the testing of polyphase and single-phase meters and maximum demand indicators, care and maintenance of standard and sub-standard testing equipment. Capable of supervising staff. Commencing salary £900 - £1,020 p.a. plus £60 - £90 local allowances. Transport provided.

(c) INSTALLATION INSPECTOR. Sound knowledge of I.E.E. regulations for the electrical equipment of buildings and previous experience in the testing of industrial, commercial and domestic installations. Commencing salary £840-£920 p.a. plus £60 local allowance. Transport provided.

Free housing (incl. heavy furniture), electricity, passages and family medical benefits. Contributory pension and insurance scheme and non-contributory dependants' benefit scheme.

Write details age, qualifications and experience to the London Secretary, 66, Queen St., London, E.C.4.

6526

A. REYROLLE & COMPANY LTD., HEBBURN,

require a SENIOR DESIGNER to work in their Research Department. The work entails the design of a very wide range of equipment, including experimental circuit breaker devices and general electrical and mechanical research equipment, principally for the purpose of measurement.

Applicants should have a sound knowledge of mechanical and electrical engineering and several years of design experience.

Apply to the Chief Engineer, A. Reyrolle & Company Ltd., Hebburn, Co. Durham. 6518

***Situations Vacant** (continued)*

ENGINEERS

VACANCIES exist with the Engineering Branch of the Industrial Group of the UNITED KINGDOM ATOMIC ENERGY AUTHORITY at its HEADQUARTERS at RISLEY, WARRINGTON, LANCS.

DUTIES : Organisation and programming of construction on various sites which include large-scale civil, mechanical and electrical projects.

Successful applicants will be required to visit these sites from time to time.

QUALIFICATIONS AND EXPERIENCE: Applicants should have served a recognised engineering apprenticeship and be corporate members of a senior engineering institution, or have equivalent qualifications. Possession of an engineering degree may be an advantage. Those selected will be encouraged to fit themselves for eventual promotion to more senior posts.

SALARY will be assessed within the scales £1,235 to £1,655 p.a. or £775 to £1,210 p.a. according to age and experience.

A contributory pension scheme is in operation.

Authority houses for renting by successful married candidates may be available in due course, or alternatively substantial assistance may be given towards legal expenses incurred in private purchase.

Send a postcard, quoting reference 1,947, for an application form to the Recruitment Officer, United Kingdom Atomic Energy Authority, Industrial Group Headquarters, Risley, Warrington, Lancs.

Closing date 22nd July, 1957. 6501

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

Revised Advertisement

SECOND ASSISTANT ENGINEER required in the Technical Section of the Chief Engineer's Department at Board Headquarters, Electricity House, Love Lane, Liverpool, 3.

Salary within range £1,145/£1,375 per annum (N.J.B. AX/DX.2).

Applicants should have had general experience in the electrical supply industry, and preferably some detailed experience in one or more branches of the field of work outlined below. Appropriate technical qualifications are desirable.

Duties will include investigations and preparation of reports thereon into matters concerned with power system protection, determination of fault flows, commissioning of electrical equipment, supervisory control, communications and metering. Some of the investigations may require the planning and carrying out of measuring projects which involve the development and application of special-purpose equipment.

Appointment subject to medical examination. Pension scheme.

Applicants who made application for this appointment following the advertisement during the week ending 2nd June, 1957, need not re-apply.

Applications should be forwarded to the Establishments Officer at the above address not later than the 15th July, 1957. 6499

EAST MIDLANDS ELECTRICITY BOARD

Fourth Assistant District Engineer, Derby District, Derby and Burton Sub-Area

APPLICATIONS are invited for the appointment of FOURTH ASSISTANT DISTRICT ENGINEER in the Derby District of the Derby and Burton Sub-Area.

The salary and conditions of the appointment will be in accordance with the National Joint Board Agreement, Class G, Grade 11 (£740 × £15 to £785 per annum).

Candidates should preferably have a technical qualification equivalent to the Higher National Certificate in Electrical Engineering, and practical experience of the construction and maintenance of static substations and associated plant would be an advantage.

Applications, stating age, qualifications, experience and present position, should be addressed to the Manager, Derby and Burton Sub-Area, 36, Full Street, Derby, so as to reach him within fourteen days of the issue of this advertisement. 6549

CENTRAL ELECTRICITY AUTHORITY

South Eastern Division

FOURTH ASSISTANT ENGINEERS (Testing) in the Operation Department at Divisional Headquarters, Kingston. Applicants should preferably possess H.N.C. or equivalent qualifications and have experience of testing large modern high pressure boiler and turbine plant. Class AX/DX, Grade 6, £750–£960 per annum. N.J.B. conditions of service. Salaries quoted include London allowance.

Applications giving details of education, present position, experience, etc., together with two copies of recent testimonials should be sent to the Establishments Officer, Central Electricity House, Lower Ham Road, Kingston-upon-Thames so as to arrive by 12th July, 1957. 6544

A. REYROLLE & COMPANY LTD.

have vacancies in their

RESEARCH DEPARTMENT :

For University Graduates, preferably with Hons. Degree in Electrical Engineering or Physics, to undertake research into problems relating to power systems, switchgear, protective gear, dielectric phenomena and insulating materials.

For men with a Pass Degree or H.N.C. to undertake general technical work and co-ordination of development testing relating to the above problems.

For men with H.N.C. as Testing Engineers in the Electrical Laboratories. Young men with lower qualifications who have served a recognised electrical engineering apprenticeship and who are proceeding with their studies may be considered for training for this type of work.

Reyrolle are among the largest switchgear manufacturers in the world and their work covers a wide field. The appointments advertised are in accordance with usual staff conditions, including superannuation, and offer interesting work with good prospects, at salaries commensurate with qualifications and experience.

Apply with full particulars to the Chief Engineer, A. Reyrolle & Company Limited, Hebburn, Co. Durham.

6519

ENGLISH ELECTRIC

STAFFORD

offers a worthwhile industrial career in a pleasant county town.

Professional Engineering Appointments.

SWITCHGEAR APPLICATIONS ENGINEER.

SWITCHGEAR DEVELOPMENT ENGINEER.

SWITCHGEAR DESIGNER.

INSTRUMENT DEVELOPMENT ENGINEER.

CONTROL AND SERVO DESIGN ENGINEERS.

Applications are invited from engineers with experience in any of these fields either in the operating or manufacturing industry.

Any housing problems associated with taking up appointments can be discussed at interview and interim subsistence allowance and help with removal expenses will be given in appropriate cases.

Please write, in the first instance, giving full details, to Central Personnel Services, 336/7, Strand, London, W.C.2, quoting Ref. ER.1296A.

6492

NORTH WESTERN ELECTRICITY BOARD

SECOND ASSISTANT DISTRICT ENGINEER, KEARSLEY DISTRICT.

Duties will include the operation, maintenance and construction of underground and overhead mains, substations and transformers, and general mains work, including standby duty. Applicants should state their experience in high-voltage mains work.

Applicants should hold H.N.C. in Electrical Engineering and Corporate Membership of the Institution of Electrical Engineers will be an advantage.

Salary scale £995 × £20 to £1,055 p.a., Grade H.7. N.J.B. conditions.

FOURTH ASSISTANT ENGINEER, OPERATION AND MAINTENANCE SECTION, SUB-AREA ENGINEER'S DEPARTMENT, BOLTON.

The duties will include the operation and maintenance of 33-kV underground and overhead distribution system and maintenance of 33-kV switchgear and transformers.

Applicants should state their experience in operation and maintenance work in the supply industry.

Preference given to applicants who hold the H.N.C. in Electrical Engineering.

Salary scale £835 × £15 to £880 p.a., Grade L.13. N.J.B. conditions.

Applications for above posts, naming three referees, to Sub-Area Manager, No. 2 Sub-Area, North Western Electricity Board, 2, St. George's Road, Bolton, by 13th July, 1957. 6500

AUTOMATIC TELEPHONE & ELECTRIC CO. LTD.

School of Electronics, Liverpool

LECTURERS IN ELECTRONIC ENGINEERING

APPLICATIONS are invited for two posts of LECTURER at the Automatic Telephone & Electric Co. Ltd. School of Electronics at Liverpool. The work involves lecturing on modern electronic techniques as applied to communication engineering.

Candidates should possess an honours degree in either

(a) Electrical engineering with electronics and telecommunications; or

(b) Physics, with electronics and mathematics.

Experience in teaching and in industry would be an advantage.

Salaries will be in accordance with the Burnham Technical Scale, and persons appointed will be required to join the company's superannuation scheme.

Application forms and details may be obtained from :—

The Personnel Manager
AUTOMATIC TELEPHONE & ELECTRIC CO. LTD.
Strowger Works, Liverpool, 7

6520

POST OFFICE: ASSISTANT ENGINEER

AT least 25 posts for men to be filled by interview. Age at least 17½ and under 23½ on 1st March, 1957, with extension for service in H.M. Forces and, up to two years, for established civil service.

Candidates must have (i) General Certificate of Education passes in English Language and four other subjects, including two at Advanced level from Pure Mathematics, Applied Mathematics, Pure and Applied Mathematics, Physics, Chemistry ; or (ii) an equivalent qualification, e.g., one based on Scottish Leaving Certificate, Scottish Universities Preliminary or Northern Ireland Senior Certificate examination ; or (iii) a Higher National Certificate in Electrical Engineering; or (iv) a City and Guilds Final Grouped Course Certificate in Telecommunications.

Starting salary (London) £465 at 18, 19 or 20, £515 at 21, £650 at 25 or over, rising to £950. Somewhat lower in Provinces.

For particulars (including prospects) and application form write (preferably by postcard) to Secretary, Civil Service Commission, Burlington Gardens, London, W.1, quoting No. 291/57. Application forms should be returned by 12th September, 1957. 6527

THE NIGERIAN RAILWAY CORPORATION

invites applications for appointment as

TRAIN LIGHTING FOREMAN.

Salary £700 × £50 to £1,200 p.a. plus £300 p.a. overseas pay. Commencing salary will be according to qualifications and experience.

Qualifications: Candidates must be capable of taking charge of the staff and all train lighting matters in a District, including maintenance and repair of all coach electric equipment, dynamos, batteries, control gear, water raising apparatus, etc., and will be expected to train staff in all related matters, including armature winding and other repairs. A knowledge of diesel and petrol engines and refrigerators would be an advantage.

Appointments on pensionable terms or on contract carrying a gratuity of 20% of total emoluments per annum.

Terms of service provide for tours of fifteen months each, seven days' full pay leave per month of service, free passages for officer and wife, and separate domicile allowance £75 p.a. each in respect of maximum of two children while in U.K. or cost of their passages to and from Nigeria, if under 18 years of age. Part furnished quarters provided at low rental. Outfit allowance £60 payable on first appointment.

Applications to be addressed to the London Representative, Nigerian Railway Corporation, 11, Manchester Square, London, W.1. 6513

SOUTH OF SCOTLAND ELECTRICITY BOARD

Lanarkshire Area

Third Assistant District Engineer Uddingston District

APPLICATIONS are invited for the above appointment. Applicants should possess the necessary technical qualifications and should have had a sound engineering training with some experience in the operation and maintenance of H.V. and L.V. underground and overhead distribution systems.

The salary and conditions of service will be in accordance with the National Joint Board Agreement, Schedule A, the present classification and grading being F.9. Salary £790/£835 per annum, which will be subject to the statutory deductions including superannuation. The successful candidate will require to reside within a reasonable distance of the district offices at Uddingston, and to take part in standby duty in accordance with the above agreement.

Application forms, which may be obtained from the undersigned, should be returned to this office within 14 days of the date of this advertisement.

DUGALD SMITH,
Manager.
137, Almada Street,
Hamilton. 6556

NUCLEAR POWER STATIONS

A. REYROLLE & COMPANY LTD. invite applications for appointments at Hebburn to fill the following vacancies in connection with the development of schemes and equipment for the control of nuclear power reactors.

1. ELECTRICAL ENGINEER or SENIOR ELECTRICAL DRAUGHTSMAN.
   To undertake the preparation of schematic and detail diagrams and associated cable layouts. The ability to design and make layouts of control panels would be an advantage. Applicants must have had some years' experience on similar work as applied to modern power stations and should possess a Higher National Certificate or equivalent.
2. SENIOR MECHANICAL DESIGN DRAUGHTSMAN.
   To undertake the design and development of electro-mechanical control equipment. Applicants must have a sound knowledge of general mechanical design work and should possess the Higher National Certificate or equivalent.

Applications stating full particulars, including details of qualifications, training and subsequent experience, should be made in writing to the Chief Engineer, A. Reyrolle & Co. Ltd., Hebburn, Co. Durham. 6490

SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT DISTRICT ENGINEER, Sutton District.

Salary £685 × £15 to £730 p.a. under N.J.B. Class F, Grade 11, plus London allowance. Superannuable. Applicants preferably of at least Higher National Certificate standard should have had a sound training and experience in electrical distribution.

Applications, naming two referees, on forms from C. W. Hughes, Esq., B.Sc., M.I.E.E., Surrey Manager, SEEBoard, Rough Rew, Horsham Road, Dorking, Surrey, by 15th July, 1957.

SALES REPRESENTATIVE, West Kent District.

Salary £490 × £20 to £590 p.a. plus London weighting, under N.J.C. Grade 1. Superannuable.

Sales representative required for special sales activities. Some knowledge of all types of domestic electrical apparatus and house wiring desirable.

Applications, on forms obtainable from P. S. Watson, M.I.E.E., West Kent District Manager, SEEBoard, 270, High Street, Orpington, Kent, by 15th July, 1957.

A. L. BURNELL,
Secretary.
6557

ENGINEERING INSPECTORS

Transmission Division

THE Transmission Division of A. T. & E. Co. at Liverpool offers positions as ENGINEERING INSPECTORS to men with factory or field experience of line transmission equipment.

Positions are on permanent staff, with generous (contributory) pension fund. The company has full range of welfare activities, including medical and dental facilities.

Applicants should have a good basic knowledge of such equipment or kindred apparatus, and should write to—

The Personnel Manager,
Automatic Telephone & Electric Co. Ltd.,
Strowger Works,
Edge Lane,
Liverpool, 7,

giving full details of experience, qualifications, age, etc.

Assistance with housing and removal expenses can be given in approved cases.

6521

CENTRAL ELECTRICITY AUTHORITY

South Wales Division
Vacancy No. 112/57

APPLICATIONS invited for superannuable N.J.B. appointment of THIRD ASSISTANT ENGINEER, TRANSMISSION DEPARTMENT at DIVISIONAL HEADQUARTERS, CARDIFF.

Salary N.J.B. AX/DX.4, £895 to £1,110 per annum.

Candidates should possess qualifications leading to Corporate Membership of the Institution of Electrical Engineers and have had experience in the maintenance of 132 kV overhead lines. Experience of 275 kV equipment an advantage.

Application forms obtainable from Secretary, South Wales Division, Central Electricity Authority, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 19th July, 1957. 6545

ELECTRICAL SALES ENGINEER

LONDON AREA. Large industrial group in North-West seeks representation for expanding subsidiary making medium-heavy electrical products of advanced design.

Excellent opportunity for enthusiastic salesman having some experience of rotating electrical equipment and with wide ranges of contacts in this field.

Brief particulars in first instance, please, to Box 6515.

CENTRAL ELECTRICITY AUTHORITY

South Western Division

TECHNICAL STAFF VACANCIES :—

(a) FOURTH ASSISTANT ENGINEER, Transmission Department. N.J.B Class AX/CX, Grade 5, £810-£935/£985, or Grade 6, £710-£835/£885, according to qualifications and experience.

(b) SHIFT CHARGE ENGINEER, Portishead "A" Power Station. N.J.B. Class J, Grade 7, £1,065 - £1,140, plus 10% shift allowance.

Superannuation.

(a) Construction Engineer to assist in the co-ordination and supervision of high-voltage overhead line contracts. Experience in the design of profiles for such lines would be an advantage.

(b) Applicants should have had considerable experience in modern power station operation. Graduate or Corporate Membership of a recognised engineering institution or equivalent desirable.

Applications on Form A.E.6/ACT, obtainable from the Divisional Secretary, 26, Oakfield Rd., Bristol, 8, should be completed and returned by 13th July, 1957. 6547

SOUTH OF SCOTLAND ELECTRICITY BOARD

Dumfries and Galloway Area

District Engineer, Annan District

APPLICATIONS are invited for the post of DISTRICT ENGINEER in the Annan District. The district is mainly rural and extends to 710 square miles in area.

Applicants should be Corporate Members of the Institution of Electrical Engineers and should have had a sound technical training with experience in the planning, construction, operation and maintenance of overhead and underground mains and substations up to 33 kV.

The conditions of service will be regulated by the National Joint Board Agreement and the salary will be in accordance with Schedule A, Class D, Grade 2, £1,065/£1,140 per annum. The post is superannuable.

The successful applicant will be required to reside within the district, for which purpose a house is available.

Applications should be submitted to the undersigned not later than 24th July, 1957.

W. H. WILLS,
Manager.
Marchmount,
Dumfries. 6512

COUNTY BOROUGH OF SWANSEA EDUCATION COMMITTEE

Swansea Technical College

Appointment of Lecturer in Electrical Engineering

(SECOND ADVERTISEMENT)

APPLICATIONS are invited from suitably experienced graduates for the full-time post of LECTURER IN ELECTRICAL ENGINEERING, qualified to lecture in electrical supply and utilisation for Part 3 of the Institute's Examination.

Salary, Burnham Technical Report, 1956, Scale for Lecturers, viz., £1,200 × £30 to £1,350 per annum.

Application forms, obtainable from the undersigned on receipt of a stamped addressed foolscap envelope, to be completed and returned not later than 23rd July, 1957.

L. J. DREW,
Director of Education.
Education Department,
Guildhall, Swansea. 6524

LANCASHIRE DYNAMO & CRYPTO LTD.

ESTIMATORS required, preferably with H.N.C. and experience of electric motors, generators and associated equipment, up to 30 h.p. Good salaries will be paid to men with the right kind of experience and existing holiday commitments will be honoured.

Apply giving details of age, qualifications, experience, etc., to

Personnel Officer
LANCASHIRE DYNAMO & CRYPTO LTD.
Acton Lane, London, N.W.10 6305

Situations Vacant *(continued)*

ELECTRICAL SUPERINTENDENT

required by GOVERNMENT OF SOMALILAND PROTECTORATE for Public Works Department on agreement for two tours each of 18/24 months, with prospects of permanency. Salary in scale (including inducement addition and present temporary allowance of 10% of salary) £1,162 rising to £1,498 a year. Free passages for officer and wife. Free passages for four children under age 18 or allowance up to £408 annually towards cost of education in U.K. Liberal leave on full salary.

Candidates should have sound theoretical knowledge of generation, transmission and distribution of electric power, and have practical experience of the running and routine maintenance of all equipment in diesel-engined power station of 3 to 1,500 installed kVA. They must be able to organise an electrical department and control staff, financial matters and office routine.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2C/42338/EF. 6552

COUNTY BOROUGH OF EAST HAM EDUCATION COMMITTEE

East Ham Technical College

APPLICATIONS invited for:—

(a) ASSISTANT GRADE B in Electrical Engineering; able to teach telecommunications subjects to final City and Guilds level, and radio servicing work.

(b) ASSISTANT GRADE B in Mechanical Engineering; able to teach fabrication of steelwork technology and workshop practice to final City and Guilds level, and welding subjects.

Salary scale £650 × £25 to £1,025, with additions for training, degree, plus London allowance of £36 or £48. Allowance made for industrial experience in fixing commencing salary.

Forms of application (returnable within fourteen days of this issue) and further particulars may be obtained from the Chief Education Officer, Education Offices, Town Hall Annexe, Barking Road, East Ham, London, E.6. 6553

ELECTRICAL ENGINEER

IF you are interested in the design of control systems for heating, ventilating and air conditioning installations you may find it worth your while to write to us. We are the largest company engaged in the design and erection of these installations, the control systems of which are becoming increasingly complex.

We have first-class modern office accommodation with a staff restaurant. There is a superannuation scheme and we work a five-day week.

Previous experience in similar fields is desirable but not essential, and if you hold the Ordinary or Higher National Certificate in Electrical Engineering and have completed National Service you would be eligible for a progressive position on our technical staff.

Your enquiry, which should state your age, qualifications, previous experience and salary required, will be treated in strict confidence, and should be addressed to A. C. Beardow, G. N. Haden & Sons Ltd., 7/12, Tavistock Square, London, W.C.1. 6517

DUNDEE TECHNICAL COLLEGE

THE GOVERNORS OF DUNDEE INSTITUTE OF ART AND TECHNOLOGY invite applications for the post of LECTURER (Grade II) in Electrical Engineering. Candidates should hold a Degree in Engineering or equivalent qualification, have some knowledge of electronics and have had a good industrial experience. Previous teaching experience is desirable but not essential.

Salary scales: Grade II(a) (Honours Degree Scale), £770 × £35 to £1,124; Grade II(b), £685 × £37 to £963. Both scales presently being revised.

Placing according to qualifications and experience.

Further particulars, conditions of appointment and application forms are obtainable from the Clerk and Treasurer, Dundee Institute of Art and Technology, 40, Bell Street, Dundee. Closing date for applications, 27th July, 1957. 6528

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for two positions as FOURTH ASSISTANT ENGINEERS in the Transmission Section of the Chief Engineer's Department. One position will be based at Galashiels and the other at Dunfermline.

Applicants should possess the minimum qualifications of a Higher National Certificate in Electrical Engineering.

Salary N.J.B. Schedule B, Class AX/DX, Grade 5, £810/£1,010 per annum. The positions are superannuable.

Applications should be submitted to the undersigned, on the standard form, not later than Friday, 12th July, 1957, indicating preference for location and if interested in either position. Please quote reference No. E31/57.

J. MEEK,
Secretary.

P.O. Box 173,
351, Sauchiehall Street,
Glasgow, C.2. 6504

WILMOT-BREEDEN LIMITED

Research and Development Division

ELECTRONIC ENGINEER

required for development of experimental electronic equipment chiefly in the audio and sub-audio frequency ranges. Previous experience of electronic development work essential, but not necessarily in this particular field. The position calls for a qualified person of degree standard or equivalent.

Applicants should write to

WILMOT-BREEDEN LABORATORIES,
Research & Development Division,
Umberslade Park, Hockley Heath,
Solihull, Warwickshire,

stating qualifications, experience, age and salary expected. 6503

SOUTH OF SCOTLAND ELECTRICITY BOARD

Ayrshire Area

Second Assistant District Engineer

APPLICATIONS are invited for the above superannuable appointment from candidates who are Graduates of the I.E.E., or who hold equivalent qualifications, and have had a sound engineering training with experience on distribution systems up to and including 33 kV.

The salary will be within Class E, Grade 7, of the N.J.B. Agreement, £835/£880 p.a.

Applications on the standard form, obtainable from any Area Manager, should be received not later than 12th July, 1957.

A. E. ROOTS,
Manager.

Greenholm Street,
Kilmarnock.
24th June, 1957. 6505

THE ENGLISH ELECTRIC CO. LTD.

has vacancies for

ENGINEERS

in its Home Branch Offices.

Applicants should have reached Higher National Certificate standard in electrical engineering and have had practical training experience of commercial work, preferably including some time on the selling staff of a home or foreign organisation.

Please write with full details to Dept. C.P.S., Marconi House, 336/7, Strand, London, W.C.2, quoting reference ER.1297F.

6491

TRANSFORMERS (WATFORD) LIMITED

require

a SENIOR DESIGNER with experience of distribution and medium power transformers. Permanent and progressive position. Generous salary commensurate with qualifications and experience.

Apply:—Chief Engineer, T.W. Ltd., Sandown Road, Watford, Herts. 6311

BRITISH INSULATED CALLENDER'S CABLES LTD.

have the following vacancies in their Power Cables Division. Good salaries and prospects of advancement. Pension fund, etc.

1. CHEMIST, aged 20/30, for chemical investigations arising from control of materials, processes and plant and in the development of improved materials and methods. Qualifications, graduate or equivalent.

2. TECHNICAL ASSISTANT or ASSISTANT TECHNICAL OFFICER for work on electro-physical problems in connection with development of cables at all voltages. Qualifications, H.N.C. standard or above.

3. ELECTRICAL ENGINEER of graduate level, or a Physicist interested in electrical problems associated with the design of cables and accessories, for work on detailed problems concerned with electrical field plotting.

Applications to Staff Officer, Erith Works, Belvedere, Kent. 6493

LONDON ELECTRICITY BOARD

General Assistant Engineers

APPLICATIONS are invited for vacancies for GENERAL ASSISTANT ENGINEERS with the London Electricity Board to be located initially at West Ham, E.15.

Applicants should have a sound technical education to the standard of the Higher National Certificate, and have completed a recognised period of training in the electrical industry, or have equivalent experience.

Pending determination as to the grading and salary applicable to the posts within the National Joint Board Agreement, the provisional minimum salary will be £590 per annum rising to £695 per annum, inclusive of London Allowance.

Application forms obtainable from Personnel Officer, 46, New Broad Street, London, E.C.2. Please quote ref. PER/2343/R. 6366

CENTRAL ELECTRICITY AUTHORITY

Headquarters

ASSISTANT ENGINEER required to assist in statistical analysis of power station operation results. Candidates should preferably have served a power station apprenticeship and have obtained H.N.C. in Mechanical Engineering. Experience in calculations of turbine and boiler test results would be an advantage. Candidates should possess an aptitude for mathematics and be prepared to study statistical methods of analysis. A genuine interest in extracting information from numerical data by detailed analysis is essential.

Salary £870-£1,045 p.a.

Applications stating age, qualifications, experience, present position and salary, to D. Moffat, Director of Establishments, Winsley Street, London, W.1, by 17th July. Quote reference E.R./290. 6546

LINDSEY (LINCOLNSHIRE) COUNTY COUNCIL

ONE ELECTRICAL ENGINEERING ASSISTANT, Grade A.P.T. III, £656/£784 2s. 6d. Should be capable of preparing drawings in connection with electrical installations in schools. Higher National Certificate required. In special circumstances consideration will be given to starting salary not more than two steps up the grade.

N.J.C. conditions of service. Canvassing will disqualify. Candidates must disclose in writing whether to their knowledge they are related to any member or senior officer of the Council.

Applications, giving age, qualifications, experience, present salary, and the names of at least two persons to whom reference can be made, to be sent not later than 22nd July to the County Architect, County Offices, Lincoln. 6502

WANTED BY NORTH COUNTRY FIRM, man with manufacturing experience of rotary machines covering both A.C./D.C. types up to 25 h.p.

The person called for must have a full technical knowledge relating to this range of equipment, and be capable of giving full technical supervision, including test room for the manufacturing unit concerned.

All applications will be treated with the strictest confidence.—Box 6188.

FLINTSHIRE EDUCATION COMMITTEE

Flintshire Technical College, Connah's Quay

APPLICATIONS are invited for the post of LECTURER IN ELECTRICAL ENGINEERING.

Candidates should preferably possess a Degree in Electrical Engineering or the Corporate Membership of the Institution or equivalent, and should be prepared to teach electrical subjects up to Higher National Certificate.

Salary in accordance with the Burnham Scale (£1,200 × £30 to £1,350).

Form of application, which must be returned by not later than 20th July, 1957, may be obtained from the Registrar, Flintshire Technical College, Connah's Quay.

B. H. WILLIAMS,
Director of Education.
6578

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

SECOND ASSISTANT ENGINEER (Protection) required at No. 2 Sub-Area Headquarters, Sandiway House, near Northwich, Cheshire.

Salary within range £1,160/£1,235 per annum (N.J.B. K/7).

Duties include testing and commissioning switchgear, transformers and associated equipment up to 33 kV. Applicants should be technically qualified, and possession of a university degree in electrical engineering would be an advantage.

Appointment subject to medical examination. Pension scheme.

Application forms obtainable from the Manager at the above address. Closing date, 15th July, 1957. 6548

NATIONAL COAL BOARD

CLERK OF WORKS required for temporary appointment at the N.C.B.'s Rothes Colliery (Scottish Division) to supervise contractors' work associated with the installation of a 2,000-kW closed circuit gas turbine. Applicants should have experience in the installation of mechanical and electrical items of plant and equipment and in general site organisation.

Appointment, according to qualifications and experience, within scale £690 to £840, exceptionally to £940.

Write, stating age, education, qualifications, present position and previous experience, to Staff Dept., National Coal Board, Hobart House, Grosvenor Place, London, S.W.1, marking envelope X/797D, before 12th July, 1957. 6514

COUNTY BOROUGH OF CROYDON

Electrical Engineering Assistant

APPLICATIONS for this appointment are invited from qualified electrical engineers experienced in preparing estimates, drawings and specifications for electrical installations in all types of buildings. Maintenance experience would be an advantage.

Salary on the scale £757 rising annually by increments of up to £52 p.a. to £1,137 p.a., commencing according to experience.

Application forms, with further particulars, from Borough Engineer, Town Hall, Croydon. Closing date, 16th July, 1957.

E. TABERNER,
Town Clerk. 6551

SURREY COUNTY COUNCIL

APPLICATIONS invited for appointment of ELECTRICAL INSTALLATIONS DRAUGHTSMAN, GRADE I, £543 5s. to £625 5s. p.a. plus London allowance of up to £30 p.a. according to age.

Full details, present salary and 3 copy testimonials to County Architect, County Hall, Kingston-upon-Thames, as soon as possible. 6388

BRITISH KLOCKNER SWITCHGEAR LIMITED

Chertsey, Surrey

TECHNICAL SALES ENGINEERS required for London and Home Counties. Knowledge of motor control gear; sales experience preferred but not essential. Apply giving full particulars to—Managing Director. 166

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

APPLICATIONS invited for the post of SECOND ASSISTANT ENGINEER in the Electrical and Mechanical Engineer's Department of the Board's Head Office, Edinburgh. Applicants should have a sound technical education and be capable of dealing with matters of technical design and investigation in generating station planning and operation. Salary commencing at a point within the range £1,145-£1,340 (N.J.B. Schedule B, Class AX/CX Grade 2) depending on experience and qualifications. Superannuation scheme.

Application form obtainable from the Secretary, 16, Rothesay Terrace, Edinburgh, 3, should be returned within 21 days from the date of this advertisement. 6554

BRITISH KLOCKNER SWITCHGEAR LIMITED

Chertsey, Surrey

ESTIMATOR for TECHNICAL SALES. Correspondence and capable of preparing control schemes involving automatic motor control gear. Experience essential.

CIRCUIT DIAGRAM DRAUGHTSMAN. Preferably experienced in preparing automatic control gear schemes.

Applicants to have O.N.C. (Electrical). Excellent opportunities with fast growing concern. Pension scheme. Apply to Managing Director, stating experience and present salary. 165

YOUNG ENGINEERS

interested in gaining experience of the erection of lattice tower, concrete and wood pole overhead transmission lines and willing to serve either at home or overseas. Technical background up to H.N.C. (Electrical) standard desirable, but previous experience of this kind of work not essential. Pension fund.

Write giving full particulars and quoting reference C/76/55 to Staff Officer, British Insulated Callender's Construction Company Limited, 30, Leicester Square, London, W.C.2. 174

ELECTRICAL DESIGN ENGINEER

required to take charge of section in Engineering Department responsible for design of Underground Mining Type Switchgear. Applicants should be technically qualified to at least H.N.C. standard and preferably have practical and/or design experience of flameproof equipment.

The position is one of responsibility and wide interest offering scope for advancement.

Applications should be addressed to the Technical Director, B.J-D. Ltd., Stennard Works, Wakefield. 6495

A PROGRESSIVE electrical engineering company in the North-East of England invites applications from men, possessing the necessary qualifications, for the position of manager of its research and development department. Applicants, who should be between 30 and 40 years of age, must have had actual experience in research management, preferably in the electrical or metallurgical industries. An honours degree would be an advantage but emphasis is placed on managerial experience. The commencing salary will be not less than £1,500 per annum, and there is an excellent contributory pension scheme. Applications, giving details of education, experience and present position held, should in the first instance be made to—Box 6559.

A WATER heater design engineer required by electrical manufacturers in the Midlands for comprehensive development programme offering exceptional opportunities to an experienced and ambitious engineer. Good salary, pension scheme and working conditions. Apply "Engineer."—Box 6494.

AUTOMATION. Contactor electric control gear engineers for training, if not already experienced, on automation and related schemes, including control of machine tools. H.N.C. or equivalent qualification preferred. Permanent position. Good starting salary with excellent prospects of progressive remuneration. Write in confidence, giving full details of previous experience, qualifications, age and salary expected, to Technical Director, Donovan Electrical Co. Ltd., Stechford, Birmingham, 33. 6522

ALBRIGHT & WILSON (MFG.) Ltd., chemical manufacturers, require a senior electrical engineer in the central engineering department, at Oldbury. The duties include preparing estimates, supervising design and the installation of varied electrical equipment including L.T. and E.H.T. switchgear and cables. Candidates aged 30-40, should possess a degree or A.M.I.E.E. and have relevant experience. A good commencing salary will be offered. The company operates a non-contributory pension scheme and a housing scheme. Apply stating age, qualifications and experience to the Staff Officer, Ref. 373, Albright & Wilson (Mfg.) Ltd., P.O. Box 3, Oldbury, Nr. Birmingham. 6474

ARMATURE winders wanted for repair shop. Apply—Minta, Hartley Road, Luton. 9013

BOOTS PURE DRUG Co. Ltd. require two electrical engineering draughtsmen, age 25-30 years. Commencing salary up to £750 per annum according to qualifications and experience. Five-day week, superannuation scheme. Applications in writing to—Personnel Manager, Station Street, Nottingham. 6447

BRITISH ENGINE BOILER & ELECTRICAL INSURANCE Co. Ltd., 24, Fennel Street, Manchester, 4. Electrical surveyors required for various districts in Great Britain. Permanent positions carrying progressive salary scale £675 to £1,000 and non-contributory pension. Candidates, age 26 to 32, preferably with H.N.C. in Electrical Engineering or Grad. I.E.E., and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply in own handwriting, stating age, qualifications and experience. 6539

BRUSH ELECTRICAL ENGINEERING Company Ltd., Loughborough, Leics, require a development engineer to design and develop H.R.C. fuses for the light machines and Fusegear Division. Applicants should hold a H.N.C. in Electrical Engineering, or equivalent qualification, and must have served an approved apprenticeship. They should also have experience of fusegear, but enginers having related experience on circuit interruptions phenomena will be considered. A good salary will be paid and conditions of service include a generous non-contributory superannuation scheme. Please apply to the Chief Personnel Officer. 6475

CHARGE hand required with experience in forming, winding and taping of electric motor armature and field coils. London district. State experience and salary required.—Box 6448.

CIRCUIT draughtsmen required by firm manufacturing industrial control equipment. Commencing salaries up to £800 per annum for first-class men, but some less experienced draughtsmen required. Canteen facilities, pension scheme, holiday commitments recognised. Housing assistance later to approved cases. West Middlesex area. Write, giving age, experience and full details, to—Box 6434.

CONSULTING engineer requires junior electrical engineer draughtsman, age 21-25, to be employed in installation design of factories, offices, schools, etc. Superannuation scheme, meal vouchers. Applicants must state salary required, qualifications, age, educational background and experience. Apply—G. H. Buckle & Partners, 2, Harrington Gardens, London, S.W.7. 6577

CONTRACT engineering assistant required by consulting engineers for detailed engineering work on 132 kV and 275 kV substations. University degree or similar graduate qualifications essential plus some practical experience with substations for these voltages. Age under 30 preferred. Salary according to qualifications and experience. Interviews Glasgow or London. Apply with full particulars, to Ref. D.S.H., Kennedy & Donkin, 4, Somerset Place, Glasgow. 6290

CONTRACTORS, old-established and progressive, invite applications for posts of: (a) Experienced estimating engineer; (b) Designer draughtsman able to design electrical installations of all descriptions; (c) Junior for (a) or (b). The posts offer good prospects and salary, also visits to sites. Write in confidence to Managing Director, Alliance Electrical Co. Ltd., 2, Henrietta Street, London, W.C.2. 190

DRAUGHTSMAN. Good education, about 20-25, preferably electrical National Certificate standard. Interesting varied work in design and sales office. Holiday arrangements respected.—Chance-Londex Ltd., 10, Rose & Crown Yard, St. James's, London, S.W.1. 6530

***Situations Vacant** (continued)*

CROMPTON PARKINSON Limited would be interested to hear from qualified men seeking positions as sales engineers. Applicants must have at least two years' commercial experience with fractional horsepower motors and will be considered for both London and provincial branches. Replies, giving details of age, experience and technical qualifications, should be sent to—MD/P/FHP, Crompton House, Aldwych, London, W.C.2. 6560

DRAUGHTSMAN required at consulting engineers' Glasgow office to assist on layout of 132 kV substations. Experience of this work desirable. Preference for man aged 20 to 28 with, or training for, H.N.C., and suitable for helping on construction supervision and/or contract work later. Salary according to training and experience. Interviews Glasgow or London. Applications with full particulars, to Ref. D.S.H., Kennedy & Donkin, 4, Somerset Place, Glasgow. 6291

DRAUGHTSMEN required by electrical engineering industry in South Wales. Full particulars giving age, experience, education and salary required, to—Box 6455.

DRAUGHTSMEN required, preferably with experience of medium voltage metalclad industrial switchgear. A.E.S.D. rates of pay and bonus scheme, non-contributory superannuation scheme also in operation. Assistance with housing will also be given if necessary to selected applicants. The company is within 6 miles of the South Devon coast. Write stating experience, age, etc., to Ottermill Switchgear Ltd., Ottery St. Mary, Devon. 6477

ELECTRIC FURNACE Co. Ltd. have a vacancy in their head office for an indoor sales engineer, capable of preparing quotations for melting furnaces and induction heating equipment. Education to H.N.C. standard or equivalent; preferably with experience of electric furnaces. Good salary and prospects for right man. Applications with full details to—Sales Manager, Electric Furnace Co. Ltd., Netherby, Queens Road, Weybridge, Surrey. 6561

ELECTRICAL contractors require an estimator, previous experience desirable, for industrial and commercial power and lighting work.—The Midland Electric Installation Co. Ltd., Cyprus Works, Upper Villiers Street, Wolverhampton. 6569

ELECTRICAL draughtsmen able to work with minimum supervision required by power station contractors, for work on nuclear power development. 5-day week, superannuation scheme, good prospects and salary commensurate with qualifications and experience. Office situate south of Manchester. Write fully in first instance to—Chief Draughtsman, Box 6425.

ELECTRICAL draughtsmen required for electrical layout work in iron and steel works in the Midlands. Good housing prospects in the area. Superannuation scheme and canteen facilities. State qualifications, experience and salary required.—Box 6562.

ELECTRICAL engineer. A graduate in electrical engineering is required to assist in the supervision of a small group engaged in development work on a range of silicon rectifiers, including high-power rectifiers. The work includes evaluation, rating, environmental testing and circuit applications. A minimum of 2 to 3 years' experience in the field of semiconductors, rectifiers (e.g., mercury arc rectifiers) or valve applications is preferred, but all applications will receive consideration. Competitive salary. Non-contributory pension scheme. Accommodation available a few weeks after engagement. Household removal expenses paid. Interviews can be arranged in London or Harlow on a Saturday morning if required. Please write, stating relevant particulars, and quoting reference C.2, to Personnel Manager, Standard Telephones and Cables Limited, Rectifier Division, Edinburgh Way, Harlow, Essex. 6523

ELECTRICAL engineer required as branch manager (Manchester area) of established electrical contractors. Applicants should have sound knowledge of electrical contracting industry. Reply in strict confidence giving full details of experience and salary required to—Box 155.

CLASSIFIED ADVERTISEMENTS ARE PREPAID

ELECTRICAL engineering assistant required by consulting engineers for surveying, testing and inspecting electrical installations and plant in factories and commercial buildings throughout the country, and preparation of reports. Write—A. J. Ramsay & Partners, 5/6, Promenade Chambers, Edgware, Middx. 6563

ELECTRICAL fitter for maintenance work in H.V. transmission substations in North London, based on Islington. N.J.I.C. conditions of service, 4s. 11½d. hr. Applications to—Transmission Eng., C.E.A., Generation House, Gt. Portland St., London, W.1. 6531

EXPERIENCED electrical breakdown man required urgently. Experienced in all types of electrical machinery. Suitable accommodation found for the right man. Apply—Collins Electrical Ltd., 22, St. Albans Place, Upper Street, London, N.1. 6404

INSPECTION engineers, electrical. A North-East Coast engineering firm engaged on work associated with nuclear power stations requires good, forceful engineers who have experience in inspection and testing of electrical equipment. Applicants should preferably have H.N.C. and be in the 25-40 age group. Superannuation scheme in operation.—Box 6566.

JOHNSON & PHILLIPS Ltd. have vacancies for young electrical engineers who have completed their training and National Service. Minimum qualification H.N.C. Good prospects for suitable candidates. Applications, giving particulars of training, qualifications and age, to —Manager, Employment and Welfare Dept., Messrs. Johnson & Phillips Ltd., Victoria Way, Charlton, London, S.E.7. 6405

JUNIOR engineer required by London electrical contractor. Must have had practical experience on medium-sized factory installations and be prepared to travel abroad on short terms 3-9 months as occasion arises. Full particulars to Managing Director.—Box 6327.

MANAGER required by London electrical contractor for the Leeds area branch. Applicants must be conversant with all types of electrical contracts, P.A. installations, P.A.X. telephone installations. Please reply stating age, salary required, to—Giles (Electrical Engineers) Limited, 37-41, Bedford Row, London, W.C.1. 6564

MANAGER required by London electrical contractor for the Sheffield area branch. Applicants must be conversant with all types of electrical contracts, P.A. installations, P.A.X. telephone installations. Please reply stating age, salary required, to—Giles (Electrical Engineers) Ltd., 37-41, Bedford Row, London, W.C.1. 6565

MEDIUM size high-class quality electrical accessories manufacturer requires junior representative, aged 23-24, to work in the Southern Electricity Board area, preferably living in Reading.—Box 6429.

NATIONALLY-known domestic appliance company with attractive lines is considering change in selling policy involving the appointment of agents in all areas. Consideration will be given to the handing over of valuable existing accounts. Established agents calling on domestic appliances and hardware dealers should write with full details of coverage to the Managing Director, Box 6430.

PRODUCTION efficiency engineer required by West London electrical engineers. Applicants with extensive experience in methods of production of medium capacity switchgear and heat controlling devices are invited to apply for important position involving operational investigations, production methods applying to machine and press shops, tool designs, time and motion study and general reorganisation of assembly departments on modern lines. Only top-class applicants considered. Write full particulars, technical education, practical experience, salary required and when available to—Box 6532.

PROGRESS engineers. Applications are invited from young, keen and forceful mechanical and/or electrical engineers by a North-East Coast engineering office. Applicants should be between 25 and 40 years of age and should have up to H.N.C. or equivalent. The post involves visiting works throughout the country and is superannuable after a probationary period. Apply stating salary required to—Box 6567.

QUALIFIED engineer or engineering designer/draughtsman required to be trained as asst. chief draughtsman in a neon sign and light engineering factory. When replying please give details of qualifications, experience, age and salary required to Claude-General Neon Lights Ltd., Wembley Hill Estate, Wembley. 6496

REFRIGERATION engineers, fully experienced, for the London and Greater London areas. High salary and commission for right persons. Transport provided. Strict confidence. —Telephone J. C. M., MUSeum 0990. 6570

REPRESENTATIVE required by leading electrical wholesalers (E.W.F.) for Northants area. Existing connection an advantage. Car provided. Superannuation scheme. Apply in first instance to—Box 9026.

RESIDENTIAL electrical engineer required at Northern Outfall Works, Beckton, London, E.6, to supervise erection and commissioning of H.V. and M.V. plant, including switchgear, transformers, alternators (three 770 kWs, 3.3 kV), cabling and motors. Salary up to £1,050 p.a. according to qualifications and experience. Application form from Chief Engineer (57/47), County Hall, London, S.E.1. (1261) 6568

SALES manager required by well-established light precision engineering company in Middlesex. Applicants should have considerable commercial and Government contractual experience with proven ability to administer sales department, including export and advertising, and initiative to extend the company's sales and products. Good salary commensurate with experience. Staff pension scheme. Write in confidence to Sales Director.—Box 6571.

SOUTH WALES SWITCHGEAR, Ltd., Blackwood, Mon, have vacancies for experienced draughtsmen. Applications giving age, experience, etc., to the Personnel Manager. 6456

TECHNICAL writer required by Crompton Parkinson Limited to assist with the preparation of articles for the trade and technical press. Applicants must have writing experience and a sound basic knowledge of electrical engineering. Five-day week; superannuation scheme. Write with full particulars of education, previous experience and salary required to MD/P2/SA, Crompton House, Aldwych, London, W.C.2. 6516

THE TELEGRAPH CONSTRUCTION & MAINTENANCE Co. Ltd., cable manufacturers, require a technical assistant in the cable design and specification department, to assist in the preparation of designs and specifications and to answer technical enquiries concerning all types of plastic insulated cables and associated matters. A salary of £750 upwards is offered to suitably qualified and experienced applicants. Apply Personnel Manager, Telcon Works, Greenwich, London, S.E.10. 6506

TRANSFORMER sales engineer required for electronic and power units to 150 kVA. Preferably with previous experience. Write, stating full details, in confidence to—Edlin Electrical Equipment Co., 5, Edwin Road, Twickenham. 9009

YOUNG engineer, preferably with university degree and sound electrical knowledge, required for training in the design of A.C. and D.C. revolving machines. London district. —Box 6533.

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

SITUATIONS WANTED

ARMATURE winder, 30 years' exp. A.C.-D.C., fully conversant all types, desires job on South Coast. Would consider abroad.—Box 9028.

BUYER/manager (37), 16 yrs.' experience. Conversant all aspects electrical wholesaling plus technical knowledge. Immediately available London or Home Counties in similar capacity.—Box 9018.

ELECTRICAL engineer, A.M.I.E.E., B.Sc., 25 years' experience H.T., power and lighting schemes, planning, specifications and supervision, seeks responsible position, London. Salary £1,500 per annum.—Box 9024.

EXPERIENCED representative, age 42, resident Leicester, with connection in M.E.B. and E.M.E.B. areas requires position commencing 1st September.—Box 9019.

FOREMAN electrician seeks change. Public works, industrial, domestic. Complete supervision.—Box 9020.

GRADUATE I.E.E., G.I.Mech.E. (24) seeks post requiring initiative and responsibility. Northern England.—Box 9023.

TO manufacturers: Wholesaler's branch manager, early 40's, energetic and more ambitious than present scope will allow or reward, seeks change to first-class representation.—Box 9027.

ARTICLES FOR SALE

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for sale by

EVERTAUT SEATING LIMITED,
HOPE MILL, DARWEN

ONE DIESEL ALTERNATOR SET, with MIRRLEES TL8 engine, direct coupled to BRUSH 366-kVA three-phase ALTERNATOR, 400 volts, 600 r.p.m., with exciter, control panel, complete with motorised centrifugal water circulating pumps, SEICK heat exchangers, CLARKSON thimble tube waste-heat boiler, lagged and planished sheet steel covered exhaust piping, gravity-feed fuel oil tanks and piping in connection. New 1951.

One DIESEL ALTERNATOR SET, with MIRRLEES TL6 engine, direct coupled to BRUSH 272-kVA three-phase ALTERNATOR, 400 volts, 600 r.p.m., with exciter (similar to above but without thimble tube waste-heat boiler). New 1951.

COMPRESSED AIR STARTING GEAR for engines, with PETTER petrol engine-driven twin-cylinder air compressor, BROOK electric auxiliary motor drive and controls, two welded steel air bottles and piping in connection.

BRUSH FIVE-PANEL MAIN SWITCHBOARD in three and two-panel sections with switchgear, meters, cabling and swing-aside synchronous control panel.

B.I.C. 50-kVA ELECTROSTATIC CAPACITOR with M.-V. 69-amp. oil-immersed isolator.

B.T.H. 250-b.h.p. PROTECTED SLIP-RING MOTOR, 488 r.p.m., with 12-groove V-belt pulleys, 31" and 123" dia., 12 E size V-belts and ELLISON control gear. 6536

UNUSED D.C. GENERATORS

QUANTITY of 24-kW and 15-kW compound wound 100-volt D.C. Generators by L.D.C., E.C.C. and E.E.C., drip-proof frames with endshield ball/roller bearings; various speeds between 1,440 and 1,625 r.p.m.

30-kW, 220-volt compound wound D.C. Generators by MAWDSLEY, drip-proof frames, 1,100 r.p.m., with endshield ball/roller bearings. Prompt delivery.

GEORGE COHEN SONS & CO. LTD.
Wood Lane, London, W.12
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Stanningley, Nr. Leeds
(Tel. Pudsey 2241) 6535

750-kVA ALTERNATOR FOR SALE

600-kW BELLISS-LAURENCE SCOTT Steam Set, 120 lb. steam pressure, 2-10 lb. back pressure, coupled to 750-kVA Alternator, 400/3/50, 300 r.p.m., with switchboard. Built 1936. Excellent condition.

REED BROTHERS (ENGINEERING) LTD.
Replant Works, Woolwich Industrial Estate, London, S.E.18
(Tel. Woolwich 7611/6) 6538

ELECTRIC MOTORS FOR SALE

375-h.p., 400/3/50, 1,000-r.p.m. METROVICK synchronous induction motor, in excellent condition.

New 200-h.p., 6,300/3/50, 750-r.p.m. CROMPTON PARKINSON auto synchronous motor.

W. H. COLLINGBOURNE & CO. LTD.
1481, Stratford Road, Birmingham, 28
(Phone, Shirley 3303) 6432

A BABCOCK & Wilcox water tube boiler will cut down your fuel costs; we can supply from stock. Two 40,000 lb. evap., 220 lb. w.p.; one 25,000 lb. evap., 200 lb. w.p.; 3,000 lb. evap., 400 lb. w.p.; Spencer Bonecourt boiler; also Marine, Cornish vertical, etc.—Burford, Taylor & Co., Ltd., Boiler Specialists, Burtayco House, Church Street, Middlesbrough (Tel. Middlesbrough 2622). 122

A NUMBER of secondhand electric motors offered for sale including 15-h.p. E.C.C., 30-h.p. B.T.H. with contactor starter, 2 28-h.p. E.C.C. (one with pony starter) and Brookhirst switchgear starters, 1 27½-h.p. Crompton Parkinson slipring motor with Allen West starter and ½-h.p. A.C. motor. All 3-phase, 400/440. Available for inspection. Offers invited for single motors or offer for the whole to clear. Apply—J. Alsford Ltd., Twickenham Road, Hanworth, Feltham, Middx. 164

A.C. and D.C. house service meters, all sizes, quarterly and prepayment, reconditioned, guaranteed one yr. Repairs and recalibrations.—The Victa Electrical Co., 47, Battersea High Street, S.W.11 (Tel. Battersea 0780). 138

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5566/9). 91

A.C. and D.C. 1/- Slotmeters. Guaranteed 2 years, 2½-50 amps. From 50/- Repairs and recalibrations. See Billiard: Tradex Meter Co., Surbiton (Tel. Elmbridge 4487). 169

ALTERNATORS from ½ to 675kVA in stock, single and three-phase, all voltages and frequencies. Guaranteed. Many unused. Send your requirements.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 162

ALTERNATORS, generators, 1-100 kVA, all voltages. Specialists—Powerco Ltd., York Rd., London, S.W.18 (VAN. 5234). 147

ALTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 330 kVA.—Britannia Manufacturing Co. Ltd., 20/26, Britannia Walk, London, N.1 (CLErkenwell 5512). 24

ALUMINIUM, brass and copper in sheets, rods, tubes, angles, etc. Sheared blanks a speciality. Approved stockholders. For immediate attention, phone or send your inquiries—R.D.C., 100, Hamstead Rd., London, N.W.1 (EUSton 5176/7). 352

BARGAINS in electric motors are always being obtained from A. Cooksley & Co. Ltd., 21/25, Tabernacle Street, London, E.C.2. Stocks include A.C. and D.C. motors, secondhand and new up to 30 h.p. Starters, slide rails and pulleys. Ring. Mon. 3355 for your requirements. 50

BILLIARD Meters. 1/-, 6d. or 1d. slot. All time settings. From 140/-. See Quarterly.—Tradex, Surbiton. 170

BRUCE Peebles 250-h.p. synchronous motor, 400 volts, 3-phase, 50 cycles, 1,500 r.p.m., complete with George Ellison starter.—Whitefield Machinery & Plant Limited, Cobden St., Salford, 6 (Tel. PEN. 4746). 303

CABLE for sale: .1 sq. in. 4-core P.I.L.C. S.W.A. & S., C.M.A., brand new, 660-volt grade, 2 500-yard drums and 1 214-yard drum, £1 per yard. .04 sq. in. 2-core P.I.L.C.S.W.A. & S., C.M.A., 4s. 6d. per yd.—C. M. Hartshorne & Co. Ltd., 778, New Hey Road, Huddersfield (Tel. Stainland 2103). 9025

CABLE, underground, all types ex stock.—E. M. Tatton Co. Ltd., Kew Bridge, Brentford (Ealing 3155/6). 117

CABLE, underground, PILC/VIR/LC, ex London stock. Cutting orders same day delivery London area. Send for priced stock lists.—Batt Electrical Co., 6, Dock Street, London, E.1 (Tel. ROYal 5905). 316

CABLES. All new on original drums. Cheap for quick sale, .1 and .3, 4-core, P.I.L.C. S.W.A.; 7/036 V.I.R. T.R.S. P.V.C.; 1/013 and 19/052 P.B.J.; overhead cable and insulators; 600-ft. 2" × ½" clean copper bus-bar; large size chrome leather cable suspenders; H.R.C. switch fuses, distribution boards, circuit breakers.—Airedale Factors Ltd., Keighley (Phone 3418). 6483

CIRCUIT breakers, various sizes in stock, A.C. and D.C., 200 amperes up to 2,000 amperes. Also dynamo and alternator switchboards.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 26

CONVERTERS, 110 and 220 v. D.C./230 v. A.C., .5 to 6 kVA; also A.C./D.C. Special voltages at short notice.—Powerco Ltd., York Rd., London, S.W.18 (VAN. 5234). 150

CRANE motors. Direct current, series wound or compound wound, all voltages. We have large stocks.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 22

ELECTRIC motors, dynamos, alternators and motor generator sets of all sizes. We hold one of the largest stocks in England. New and reconditioned, with 12 months' guarantee.—Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.1 (Clerkenwell 5512, 3 lines); also Works and Stores, Chobham, Surrey. 20

DIESEL generating sets, all sizes to 500 kW. Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 16

ELECTRIC motors, generators, control gear, transformers, A.C. and D.C., new and reconditioned; all covered with our usual 12 months' guarantee; large stocks available.—Electropower Co. Ltd., Kingsbury Works, Kingsbury Road, London, N.W.9 (Colindale 4621-2). 42

ELECTRIC motors, generators, motor generator sets, transformers, switchgear, etc., large comprehensive stock, overhauled and guaranteed. Copy of our Register, "Electrical Surplus," containing thousands of items of electrical plant, sent on request.—R. F. Winder Ltd., Belgrave Electrical Works, Leeds, 2. 54

ELECTRICIANS. Send for details Shaftesbury lightweight "Bantam" ladders. Top sections fitted with patent moulded rubber blocks, eliminate possibility of scratching or marking walls, fascias, and other painted or highly polished surfaces. Also available for immediate delivery, steps, platform steps, trestles, telescopic trestles, pole and builders-type ladders, and all sizes of two and three-section extension ladders.—Shaftesbury Ladders Ltd. (E.R.), 453, Katherine Road, London, E.7 (Phone: Grangewood 3363/4). 111

FLUORESCENT fittings, lamps, starters and control gear for home and export. Fully guaranteed by actual manufacturers. Send for catalogues.—The Anglo-American Electrical Company, Olive Street, Bury, Lancs. 245

FLUORESCENT tubes reconditioned and guaranteed as new for 7s. 6d. each. Free collection and delivery in Lancs and Yorks.—The Anglo-American Electrical Company, Bury New Road, Breightmet, Bolton, Lancs. (Telephone, Bolton 7251). 212

FOR sale, H.T. transformer-rectifier set, input 380/420 v., single-phase, output up to 40,000 v. at 375 milliamps. D.C. Unused, by Ferranti. List price less 75%. Further details from—Box 6572.

FRACTIONAL h.p. motors, new, ex stock, A.C./D.C., Universal, B.T.H., Delco-Remy, G.E.C., Fracmo, Newman, Scophony. — Jeary Electrical Co. Ltd., 5, Lamb's Buildings, London, E.C.1. 126

GENERATING plants, remote and M/F up to 10 kVA; also secondhand A.C. and D.C. sets up to 100 kVA, large stock all types. Special plants built at short notice.—Powerco Ltd., York Rd., London, S.W.18 (Tel. VAN. 5234). 151

GENERATING sets for sale, petrol, diesel and steam, from 1 kW up to 700 kW. A.C. and D.C. switchboards.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 161

HOUSE service meters, C. & H., Aron, E.A.C., 20-240 v. A.C., s.-ph., 50 c., 2½ amps., 7s. 6d. each, 1s. 6d. postage; 5 amps., 17s. 6d.—Universal Electrical, 217-221, City Road, London, E.C.1. 37

MOTOR generator sets and converters, all sizes and voltages from ½ kW up to 500 kW in stock.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, City Road, London, N.1 (Tel. Clerkenwell 5512, 5513 & 5514). 12

MOTORS, starters, circuit breakers. Large stock of all types, ½ to 300 h.p., new or reconditioned, for immediate delivery. Stock list or quot'n by return.—J. S. Ramsbottom & Co. Ltd., Elec. Engs., Keighley (3774/5/6). 70

NAMEPLATES, engraving, diesinking, stencils.—Stilwell & Sons Ltd., 153, Far Gosford Street, Coventry. 108

PHASE converters, single to three-phase, several sizes in stock up to 90 h.p., 3-phase loading.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 29

PLATING dynamos and motor generator sets, various sizes from 500 amps. up to 2,000 amps., with A.C. or D.C. motors.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 15

POLYPHASE kilowatt hour meters. Available from stock.—Universal Electrical, 221, City Road, London. E.C.1. 40

PREPAYMENT 1s. slot house service meters.—Universal Electrical, 217-221, City Road, London, E.C.1. 36

PURLEY chokes and ballasts. Our 80-w. tapped h.p.f. ballast with starter switch-holder incorporated is proving itself the most popular unit. Suitable for most fittings. 57s. 6d. each subject.—F. W. Blanshard Ltd. (Dept. ER), Purley, Surrey (Uplands 4818/9). 52

QUARTERLY Credit Meters, single & poly-phase, 2½-100 amps. From 17/6d. Also D.C. See Television.—Tradex, Surbiton. 171

***Articles for Sale** (continued)*

ROTARY converters in stock, all sizes: enquiries invited.—Universal Electrical, 221, City Road, London, E.C.1. 34

SMALL BA screws and nuts in steel, brass and stainless steel, from stock.—Premier Screws & Repetition Co. Ltd., Woodgate, Leicester. 180

TELEVISION slotmeters & Time Switches. Details from: Tradex Meter Co., Surbiton. Elmbridge 4487. 172

TENDERS are invited for the purchase of four drums of unused cable by W. T. Henley Tel. Works Co. Ltd. Each drums contains 166 yards of 3-core 0.1 22-kV paper-insulated, lead-covered and served single-wire armoured cable. Pressure tested. Tenders should be sent to Boots Pure Drug Co. Ltd., Station St., Nottingham, marked for the attention of the Engineering Dept., Beeston. 6537

VENNER time switches, 200-240 v. A.C./D.C., 10-50 amps., from stock.—Universal Electrical Co., 221, City Rd., London, E.C.1. 38

WARD Leonard motor generator sets, all sizes.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1 (Tel. Clerkenwell 5512). 10

5 Avery balancing machines, type 7206, maximum diameter of work 16", maximum length of work 16", weight of work pieces 3 oz. - 30 lb., electric supply 380/420 volts, 3-phase, 50 cycles, sensitivity 0.0004 oz. for 3 oz. rotor.—Garrard Engrg. & Mfg. Co. Ltd., Swindon, Wilts. 6497

400-cycle to 1,500-cycle motor alternators and alternators.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 27

1,000 new storage cells for sale, heavy duty, 570 amps., ebonite container and sealed covers. Orig. made for Admiralty, packed 4 per wood case for transit. Low price for quantities.—Burleigh Alpine Works, Empire Way, Wembley (Tel. 0211). 324

EQUIPMENT FOR HIRE

GENERATING set hire service. Consult the most experienced firm for A.C. and D.C. units from 2 kW to 240 kW diesel or petrol. stationary or mobile, sale or hire. 24-hr. breakdown service.—Dawson-Keith Ltd., Hillview Rd., Sutton, Surrey (Fairlands 4401). 46

RELIABLE, self-contained diesel electric generating sets for hire, 2.5 to 260 kW. Night and day maintenance service. Quotations by return.—Whitetrade Limited, Rochester, Kent (Tel. Chatham 4638/9). 294

ARTICLES WANTED

ELECTRICAL trunking wanted in good secondhand condition, 4" × 4" or slightly larger. Up to 1,000 yds. required.—Box 6507.

HARRINGTON & SONS, reclamation contractors, want redundant A.C./D.C. electric motors and transformers, stocks of cable, etc. — 109, Beaconsfield Street, New Beckton, East Ham, London, E.6 (ALB. 1388). 315

READY money for redundant electrical equipment. Complete works bought outright for expert and rapid dismantling.—F. C. Larkinson Ltd. (Est. 1880), Hitchin Street, Biggleswade, Beds. (Tel. 2391) (12 branches throughout the country). 281

SPOT cash paid on collection/delivery for scrap electric motors, transformers, cable and all scrap metals.—Jackson, 33, Southgate Road, London, N.1. 9004

SURPLUS laminations, enamel copper wire, screws, nuts, flex. Good prices paid. Full details to—Box 199.

SURPLUS stocks of all types for domestic electric appliances wanted for prompt cash. Large funds available.—Spears, 14, Watling St., Shudehill, Manchester (Phone, Blackfriars 1916) (Bankers, Midland Bank Ltd.). 8818

WANTED, D.C. and A.C. ball-bearing motors, motor generator sets, dynamos and alternators. Full details to—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1. 13

WANTED for prompt cash, ferrous and non-ferrous scrap, also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. & H. Cooper Ltd., 176, Brady St., Bethnal Green, London, E.1. 120

WANTED, rotary converters, any sizes.—Universal, 221 City Rd., London E.C.1. 35

WANTED, surplus stock cable, all types and sizes. We can inspect.—Box 220.

WORK WANTED AND OFFERED

A.C. and D.C. motor rewinds and repairs. Prompt service, fully guaranteed.—Edgware 5566/9; Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. 92

PRODUCTION sheet metal capacity available by company with stove enamelling and electrical assembly facilities, i.e., fluorescent fittings, electric fires, etc.—Box 6576.

SMALL armature, stator, transformer and general coil winding undertaken on production run.—Kensal Electrics Ltd., 151, Kensal Rd., London, W.10 (LAD. 4530). 202

AGENCIES

AGENTS required by manufacturers of fluorescent fittings and control gear calling on wholesalers and contractors in the Bristol and West Country, South Wales and Newcastle areas.—Box 6575.

AGENTS required calling on retailers and large stores. Good commission. Complete range domestic appliances, replacement elements. State territory and other lines carried.—Box 6573

AGENTS required complete range terminal blocks—porcelain, bakelite, nylon, etc. Applicants must have connections with manufacturers. State territory and other lines carried. —Box 6574.

EXPORT Agent offers assistance to small manufacturers.—Box 9017.

BUSINESS OPPORTUNITIES

ELECTRICAL contractors, North East Coast, established nearly 40 years, expanding into the field of plant and speciality equipment distribution, would like to make contact with manufacturers interested in establishing sole distribution, installation and maintenance arrangements in the four Northern Counties and the North Riding of Yorkshire.—Box 6454.

MANAGING director of old-established firm of electrical contractors in the N.W. on account of age and declining health is desirous of meeting suitably qualified engineer willing to assist in running the establishment with a view to ultimately taking over the business—or would sell shares outright now. All replies treated in strict confidence.—Box 6534.

MANUFACTURERS of quality fluorescent fittings, tubes, starters and control gear wish to contact quantity buyers, wholesalers, agents, etc., interested in purchasing in quantity at special low prices. Advertisers are interested in long or short term arrangements.—Box 213.

BUSINESSES FOR SALE AND WANTED

FOR disposal, old-established welding plant manufacturers' business (est. 45 years). Heavy section class. Proprietor retiring. Capital required £3,000. Turnover £10,500, chiefly export. Important orders on books.—Box 6059.

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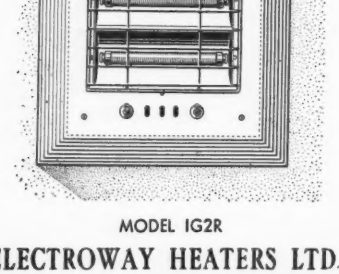

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COMPANY MEETINGS

TELEPHONE RENTALS LIMITED

Another Successful Year

Mr. Fred. T. Jackson on a Sound and Healthy Position

THE 28th Annual General Meeting of Telephone Rentals Limited was held on 1st July in London, S.W.1, Mr. Fred. T. Jackson, O.B.E., Comp.I.E.E. (Chairman and Joint Managing Director), presiding.

The following is an extract from the statement by the chairman which had been circulated with the report and accounts for the year ended 31st December, 1956 :—

You will have seen from the Balance Sheet and Profit and Loss Account that we have had another successful year and that the profits have slightly increased.

You may remember that at our last Annual General Meeting I forecast that the business we had taken during 1955 would be reflected in the 1956 Accounts. This statement was made without taking into consideration the further inflation that has taken place with the resultant increase in overheads. This does not alter the fact that the increased rent obtained will greatly benefit the Company in future years, though it should be appreciated that the Company is at present passing through a phase of expansion due to its increased business during the past few years. This expansion involves considerable additions to the numbers employed on all sides of the business, and, in several parts of the country, larger and inevitably much more expensive office accommodation.

New Branches

During the year we found it necessary to open a second Branch in Birmingham, which is of course the centre of a very productive area. It may be recollected that some years ago we created three new Branches in London, making a total of four, in place of the original one. The improved results since we took this step have been most remarkable, and the extra expenditure involved has been more than justified.

It will probably be of interest to you that we set ourselves a target of business to be obtained at the beginning of each year, and that this target was exceeded by more than 10% for the year under review. Up to the end of the first four months of the current year our revised target has again been exceeded. As we base our estimates of the finance necessary to cover our material and labour requirements on these targets, it is desirable that the percentage deviation either way should not be too great.

There is a saying that "nothing succeeds like success"; but there is a little more to it than that. In addition to our Profit Sharing Scheme, we pride ourselves on good leadership. This phrase applies not just to the executives at Head Office, but to all our Branch Managers and Branch Engineers throughout the Organisation. This, combined with our Profit Sharing Scheme, causes practically all employees, whatever their status, to identify themselves with the success of the Company, and all feel that in doing their best they contribute to the prosperity of the Company.

You may remember at our last Meeting I pointed out that our activities necessitated very considerable capital outlay. We therefore took the opportunity early this year of making a further Rights Issue to shareholders which was taken up by them to the extent of 95.75% of the total issue. Applications for excess shares were received from over 40% of the shareholders for fifteen times the number of shares available.

I also referred last year to the great service your Company gives to productivity, and it is quite obvious that not only manufacturers recognise the advantages of availing themselves of our Services, but that our assistance to productivity is also appreciated by the C.I.C.

Overseas Activities

I will now deal with our activities in Branches within the British Commonwealth. My colleague, Mr. W. Stuart Philcox, made a tour through Canada, South Africa and Australia during the early part of this year. In addition, during the year under review, key members of the staffs of all our Overseas interests spent varying periods of time in this country. Apart from their value for training and instruction purposes, these visits are regarded as being of the greatest importance in that they build up the Company spirit which exists throughout the Organisation.

Dealing first with Canada. We are still limiting our activities to Toronto, and are gradually building up a successful business around this city. As I have explained on previous occasions, it will be some little while before our Canadian subsidiaries are in a position to make a contribution to our profits over here, but there is every indication that it will not be long before they are working at a profit.

South Africa is financially self-supporting and our Companies there are on a profit-earning basis. They continued to expand during 1956 despite more difficult trading conditions, and prospects for the current year are not unfavourable.

The Company in Australia, which at the present time is not wholly owned by your Company, had a very satisfactory year and now has a very substantial rental income. It should not be long before we are receiving good dividends on our investment.

Paris and Brussels have both operated at a small profit, and in spite of severe competition they continue to make headway.

As you know, we have one Subsidiary which does not do any business in Telecommunications, but is engaged in the supply of Cold Rooms and Deep Freeze Equipment. This has expanded very much during the year and is able to make a substantial contribution to our results.

Profit and Loss Account

The Gross Profit of £753,739 is but £7,895 greater than the 1955 figure. This result is somewhat disappointing considering the effort expended by all concerned in dealing with a record amount of business, and is almost entirely due to the increase in the cost of overheads. As you can see from an examination of the Profit and Loss Account, our receipts were up by £207,456, whilst our operating costs were up by £147,347, and the balance of the increased revenue was taken up by an increase in the provision for Depreciation of £52,214. This latter increase is inevitable in an expanding business.

Income Tax and Profits Tax are up on the previous year by £5,502, and the Net Profit, before transfers to Reserves and provision for Dividends, at £404,767, is down by £20,876. The reason for this drop in Net Profit, apart from the increased taxation, is that we have not the benefit this year of the credit to the Profit and Loss Account of the £23,269 adjustment in the Tax Reserves which took place in 1955.

We have again this year transferred the sum of £200,000 to the General Reserve, which now stands at the substantial figure of £1,350,000.

We have, therefore, transferred a further £60,000 to the Tax Equalisation Reserve, which now amounts to £680,000. This Reserve, as I explained last year, represents the difference between the written down value of the Assets in our books and the written down value for taxation purposes. This difference is accounted for by the initial Capital allowances and the different rates of wear and tear allowances granted by the Inland Revenue as opposed to our rates of Depreciation.

After providing for these transfers to Reserves and the Dividends on both the Ordinary and Preference Shares amounting to £152,030, as compared with £136,850 in 1955, we are left with an unappropriated balance of £152,374 to be carried forward to the current year. I should perhaps explain that the increase in the amount of the Dividends is accounted for by the fact that we have provided for the Final Dividend on the Ordinary Shares, as increased by the Rights Issue made in January, 1957.

Balance Sheet

The issued Capital remains unaltered, and the Capital Reserves are slightly lower as a result of losses incurred on the sale of House Property. The Revenue Reserves now total £1,450,000, and the shareholders' interests consisting of Capital, Reserves and unappropriated Profit Balance amount to £3,867,050, as compared with £3,675,175 at the end of 1955.

The increase of £41,000 in the Reserves for future taxation is accounted for by the additional transfer to the Tax Equalisation Reserve mentioned previously, and the reduction in the Income Tax liability for 1957/58, which is based on this year's Accounts.

The Current Liabilities show a moderate increase over the previous year of £43,166, which you can see is distributed amongst the majority of the items comprised under this heading.

Turning now to the Assets side of the Balance Sheet, the net value of the revenue bearing Installations is £3,144,856, which is equivalent to 1.41 years' rent.

The value of Freehold and Leasehold Properties at cost has increased by £10,370, as a result of additional purchases of House Property and the increase in the net value of Office Furniture and Fittings, Vans and Cars is nothing abnormal.

Trade investment at cost represents our holding in the Australian Company which I explained to you on a previous occasion, and the increase of £32,000 over the previous year is a further investment in the Capital of that Company.

The total amounts invested in our Subsidiary Companies are up by £78,815, of which no less than £67,619 is represented by amounts capitalised in our Canadian Subsidiaries during 1956. This sum consists of the total cash and goods supplied during the year.

The Stock and Work in Progress has increased by £133,936, quite a substantial increase, but a necessary one in view of the record amount of new business secured in this country and our increasing requirements overseas. Work in Progress alone accounted for £51,615 of this increase.

Sundry Debtors and Prepayments have risen by £48,442, of which £30,016 is accounted for by an increase in Subscribers' balances outstanding. This figure is a little bigger than we should like it to be, but is not abnormal, and our bad debts reserve is more than adequate.

Our liquid resources in the form of Tax Reserve Certificates, Treasury Bills and Cash, both in London and Australia, show a fall of no less than £322,975 to £550,521. This figure was further depleted at the beginning of the year when we utilised some £250,000 Tax Reserve Certificates to pay our 1956/57 Income Tax Liability. The rapid decline in our cash resources was foreseen by your Board, hence the reason for the application to the C.I.C. in the autumn of last year, the outcome of which you already know.

Consolidated Balance Sheet and Profit and Loss Account

The Net Profit of the Group before taxation is £789,103, compared with £790,548 for 1955. After providing for Taxation, the transfers to Reserves, and Dividends, the balance of unappropriated Profits carried forward and attributable to the Holding Company's Shareholders amounts to £252,182.

Conclusion

In conclusion, I think you will agree with me that the Accounts and Report show that your Company is in a sound and healthy position. We always have in mind that we have to build for the future and consequently place very great importance on what I might term "the younger generation," growing up to take greater responsibility in the future and to ensure not only leadership but the permanent stability of your Company.

The report and accounts were adopted and the dividends, as recommended, were approved.

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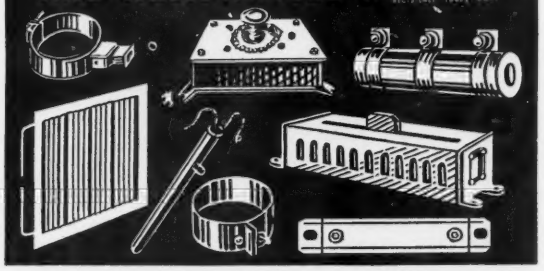

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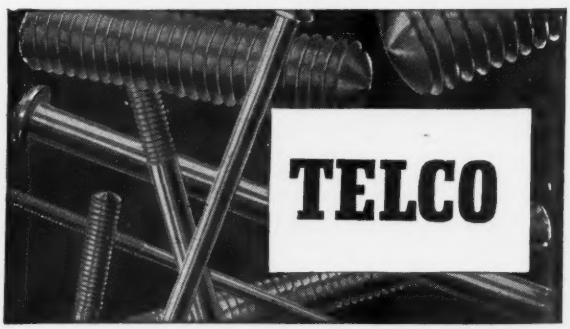

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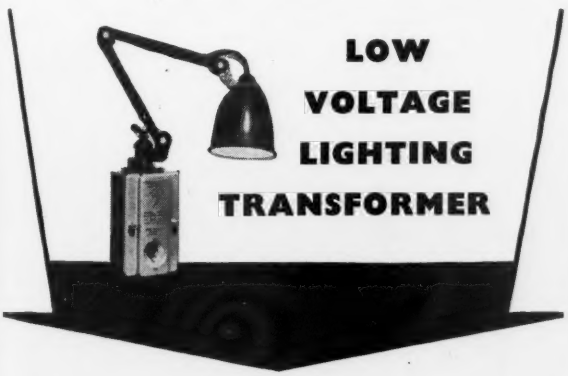

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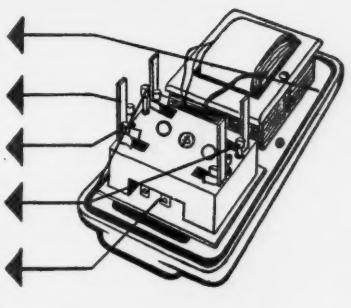

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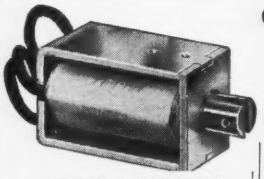

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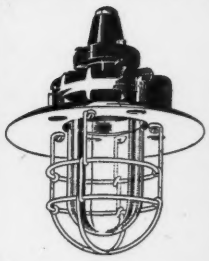

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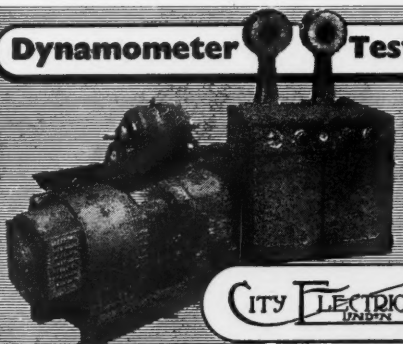

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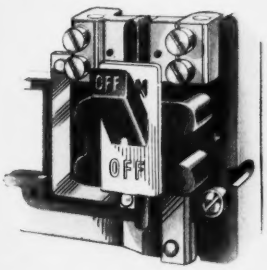

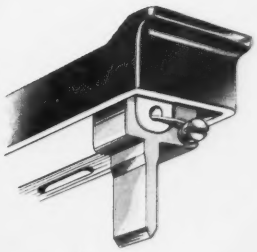

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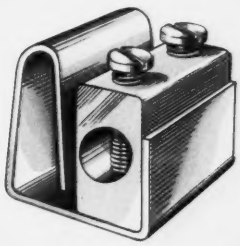

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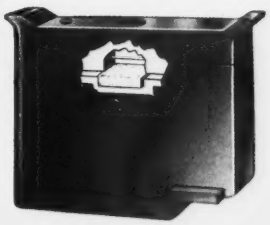

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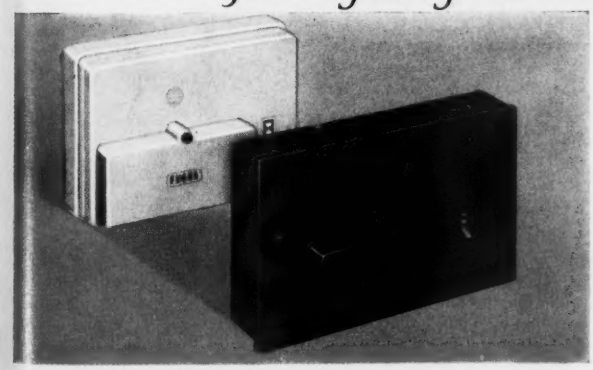

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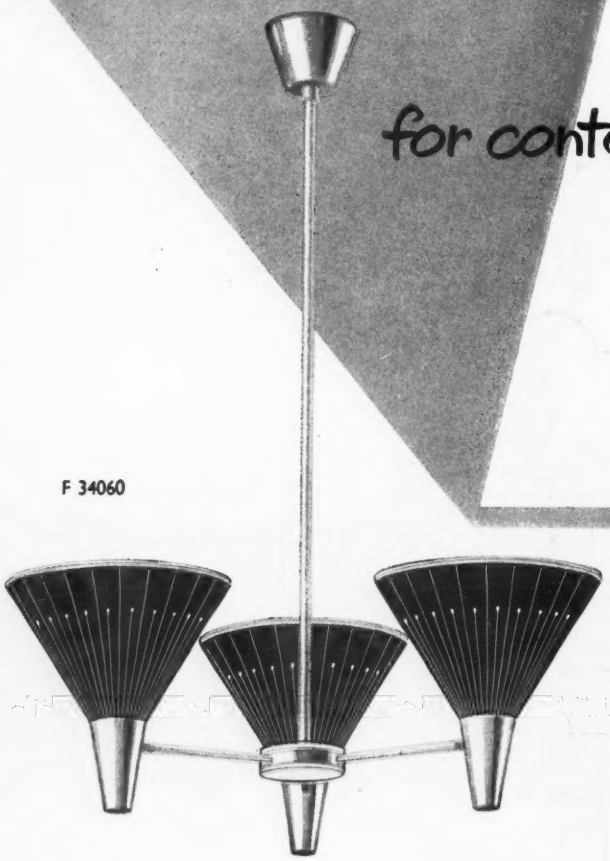

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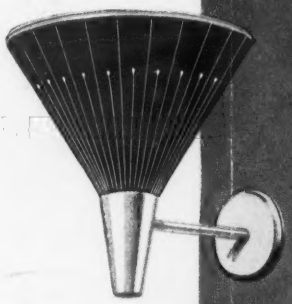

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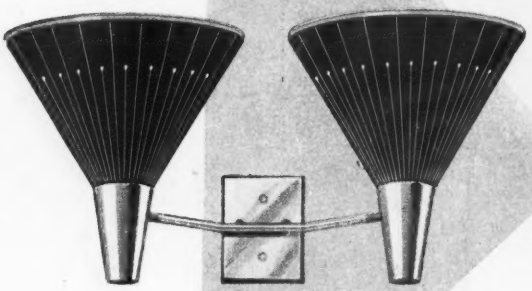

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